MODELING VAPOR–LIQUID EQUILIBRIA OF REFRIGERANT MIXTURES USING A NOVEL EOS-G^E MIXING RULE IN A CORRESPONDING STATES FRAMEWORK

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CERTIFICATE

It is certified that the work contained in the thesis entitled **"Modeling Vapor–Liqu Equilibria of Refrigerant Mixtures Using a Novel EOS–G^E Mixing Rule in Corresponding States Framework"** by **Bejoy Thottan,** has been carried out under supervision and that this work has not been submitted elsewhere for a degree.

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CONTENTS

ABSTRACT

An ever increasing concern on the stratospheric ozone depletion has led to a world wide ban on chlorofluorocarbons (CFCs) and prompted rigorous search for alternative refrigerants with zero Ozone-Depletion Potential (ODP) and lower Global Warming Potential (GWP). To develop an optimum alternative to replace an existing CFC pure fluid or mixture requires accurate thermodynamic information (especially vapor-liquid equilibrium behavior) of not only the old refrigerants, but also of the possible replacements. In the present study, the capabilities of an innovative mixing rule using different G^E models (UNIFAC, Modified UNIFAC and Correlative) have been explored in the equation of state (EOS) modeling of isothermal binary vapor-liquid equilibrium (VLE) for vastly extended range of refrigerant mixtures and conditions.

Incorporating the Generalized Corresponding States Principle (GCSP) in a G^E-EOS mixing rule framework, two different procedures are used for calculation; one correlative and other predictive. In correlative mode, the liquid phase activity coefficient, γ, is generated from input VLE data while in predictive mode it is calculated from UNIFAC and Modified UNIFAC models. EOS is also used in three different ways; in the first two, fixed reference fluids are used with different scaling factors and in the third one, pure components of the mixture are used as reference fluids. All the nine possible combinations obtained by combining the correlative and two predictive G^E models with GCSP framework in three different ways are studied here. Wong-Sandler-Teja mixing rules for the pseudocritical properties are used except for T_{cmix}. T_{cmix} values are locally generated and correlated as functions of temperature and composition. The results in both modes show good accuracy in representing the VLE behavior of refrigerant mixtures over large ranges of temperature and pressure.

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NOMENCLATURE

Alphabets

a	Cohesive energy parameter in cubic equation of state
a_{mn}	UNIFAC interaction parameter
A	Parameter in fugacity coefficient expression
b	Co-volume parameter in cubic equation of state
B	Parameter in fugacity coefficient expression
$\hat{f}_i$	Fugacity of component 'i' in mixture
G	Molar Gibbs free energy
K	Kelvin
l	Parameter in the combinatorial expression of activity coefficient mc
N	Number of data points
N_i	Number of moles of component 'i'
P	Pressure
q_i	van der Waals surface area parameter
Q_k	Group surface area
r_i	van der Waals volume parameter
R	Universal gas constant
R_k	Group volume parameter
T	Temperature
v	Molar volume
V	Total volume
x	Mole fraction in liquid phase
y	Mole fraction in vapor phase
z_i	mole fraction of component 'i' in any phase
Z	Compressibility factor

Greek letters

α	Temperature dependence of Parameter a
α_{mn}	Term in the expression of M-UNIFAC interaction parameter
β_{mn}	Term in the expression of M-UNIFAC interaction parameter
δ	Saturated liquid density based scaling factor
δ_{mn}	Term in the expression of M-UNIFAC interaction parameter

ϕ	Fugacity coefficient
γ	Activity coefficient
κ	Parameter as defined in eqn.(3.14)
θ	Parameter in UNIFAC model
ω	Acentric factor
ψ_{nm}	Parameter related to energetic interaction between groups

Superscripts

comb	Combinatorial part of activity coefficient model
E	Excess property
l	Liquid phase
res	Residual part of activity coefficient model
v	Vapor phase

Subscripts

c	Critical property
cmix	Pseudocritical property
cal	Calculated quantity
exp	Experimental quantity
i, j	Components in mixture
mix	Mixture
nm	Groups 'n' and 'm'
r	Reduced property

Abbreviations

EOS	Equation Of State
GCSP	Generalised Corresponding States Principle.
M-UNIFAC	Modified UNIquac Functional group Activity Coefficient model
PRSV	Peng-Robinson EOS Modified by Stryjek and Vera
UNIFAC	UNIquac Functional group Activity Coefficient model
UNIQUAC	UNIversal QUAsi Chemical
VLE	Vapor-Liquid Equilibrium

CHAPTER 1
INTRODUCTION

In 1930s synthetic chemical compounds like chlorofluorocarbons (CFCs), which are extremely stable, non-toxic, non-flammable, and relatively inexpensive to produce, were developed as substitutes for refrigerants like ammonia. They are also used as blowing agents in polymer foam manufacturing and cleaning solvents in electronic circuit manufacturing. Later, the study of the 'ozone hole' above Antarctic established the relationship between the chlorine and ozone content in the stratospheric zone and dictated that the chlorine oxide ($ClO^{\cdot}$) radical formed by the chlorine atoms released by CFCs are mainly responsible for ozone destruction. Fully halogenated CFC refrigerants have extremely adverse environmental effects in that they deplete atmospheric ozone to atomic oxygen (Gow et al., 1996). The Montreal Protocol (1987) and its London amendments (1990) restricted the production of CFCs and forced the refrigeration industry to totally phase out CFCs by 1995 in order to tackle the problem of ozone depletion. The Montreal Protocol in its condensed version is given in Appendix.

Many traditional solvents and refrigerants are on the environmental "hit list" (Krishner, 1995), and are to be phased out within next few years. Fluorinated and chlorinated hydrocarbons (especially CFCs) have been identified as primary culprits in the deterioration of the ozone layer. In many cases such as refrigeration applications (which is the most important area of use of CFCs), it is necessary to develop alternative fluids to replace CFCs. The existing equipment can be used with minimum modification if the replacing fluid has similar thermodynamic properties as CFCs. The less harmful, but still ozone depleting hydrochlorofluorocarbons (HCFCs) were suggested for use as "bridge" refrigerants or as a short-term alternative in replacing CFCs, but should be phased out of production over next few years. Mixtures of hydrofluorocarbons (HFCs) and HCFCs too were suggested as alternative refrigerants, though now fluorinated alcohols and their mixtures with HFCs and HCFCs and other fluids are also being considered (Sauermann et al., 1993; Laugier et al., 1994; Nowaczyk and Steimle, 1992).

Hydrofluorocarbons (HFCs), which do not form ozone destructive free radicals, are being considered as possible replacements for CFCs and HCFCs, although a complete match of thermophysical properties (i.e. vapor pressure, latent heat, vapor and liquid heat capacity, density, and viscosity) of a particular CFC or HCFC is generally not possible using pure HFC. A much improved match of multiple properties can be achieved using azeotropic HFC blends which undergo little fractionation over the practical range of operating conditions. The use of mixtures of halogenated alkanes can result in energetic improvements, extensions of application range and favourable influence to undesirable properties of one of the components, such as green house effect implications, flammability, or insolubility in oil. For example HFC-134a is one of the promising candidate as an alternative refrigerant with low ozone-Depletion Potential (ODP) and Global Warming Potential (GWP). But because of poor compatibility with lubricants due to absence of chlorine atoms, pure HFC-134a cannot be used as such. This disadvantage can be eliminated by mixing it with other refrigerants (e.g. HCFC-124), which have a good compatibility with lubricants. Azeotropic mixtures have merit when used as refrigerants because they show behavior similar to pure components.

Thus the need for new solvents and refrigerants is driven by the needs of new applications and processing requirements, the need to replace solvents or refrigerants whose continued use pose a threat to environment health and safety, a response to changing environmental regulations and a response to market demands. The list of possible choices for new refrigerant mixtures and solvents to replace CFCs is very large and growing. Owing to the phase out of CFCs, the need for reliable thermodynamic data for the replacement fluids has increased rapidly. To develop an optimum alternative to replace an existing CFC containing refrigerant requires accurate thermodynamic information (especially vapor-liquid equilibrium behavior) of not only old refrigerants, but also of the possible replacements. There is an ongoing search for both experimental data and equations that correctly describe the thermodynamic properties of the possible replacement fluids. In addition when process equipments such as separations units, heat pumps and refrigeration systems are simulated or designed, physico-chemical properties of the fluids involved must be known. The outcome of the simulation or design depends on the accuracy of the correlations used in the prediction of physico-chemical data. So it is of utmost importance that the correlations used correctly

describe the properties of the fluids. To obtain detailed experimental data for all promising substitutes is expensive and time consuming. At present, the best choice for the design engineer is to collect a minimum amount of data at selected temperatures and pressures, and then to use this data with a model to extrapolate phase behavior to other temperatures and pressures.

In this work, the emphasis is on the use of a recently developed EOS-G^E mixing rule (Scalabrin et al., 2000) that combines an equation of state (EOS) model with excess Gibbs energy, G^E. The mixing rule is in the form applicable under general temperature and pressure conditions, in contrast to the conventional procedure that uses EOS-G^E model under specific temperature and pressure conditions. A generalized corresponding states principle (GCSP) proposed by Teja (1980) is used in three ways (1) with 'Ar' and 'R134a' as reference fluids and 'ω' as scaling factor (2) with 'Ar' and 'R134a' as reference fluids and 'δ' (Cristofoli et al., 2000) -based on saturated liquid density alone- as scaling factor and (3) with pure components of the binary mixture as reference fluids for which no scaling factor is required, and in each case Vapor-Liquid Equilibrium (VLE) calculations are done with two modes, one predictive and the other correlative. Predictive mode in itself calculates the liquid phase activity coefficient, γ, using two activity coefficient models namely UNIFAC and Modified UNIFAC (M-UNIFAC). Correlative mode uses experimental VLE data as input and liquid phase γ is generated from that. A version of Peng-Robinson (1976) EOS improved by Stryjek and Vera (1986a) called PRSV equation, is used for all the reference fluids except Argon, for which a new function of the temperature dependent term α (Twu et al., 1995) is used. The present work thus investigates the ability of new mixing rule, effect of scaling factor and reference fluids in GCSP and compares the predictive (UNIFAC & M-UNIFAC) and correlative modes. Isothermal VLE of 30 binary mixtures pertaining to the halogenated alkanes family, most of which are widely used as refrigerants, have been calculated and studied using the methods mentioned above.

CHAPTER 2

LITERATURE REVIEW

The available models for vapor-liquid equilibrium (VLE) calculations can be classified as activity coefficient (so-called γ-ϕ) model or equation of state (so-called ϕ-ϕ) model. In activity coefficient model the liquid phase and vapor phase non-idealities are expressed in terms of an activity coefficient (γ) and fugacity coefficient (ϕ), respectively. The procedure of using an equation of state (EOS) to calculate the fugacity coefficient of species in both phases is referred to as an EOS approach.

2.1 VLE MODELING USING ACTIVITY COEFFICIENT MODELS

In this method (γ-ϕ approach), the fugacity of vapor phase is calculated using a suitable EOS (usually pressure explicit) using the following equation.

$$\ln\left[\frac{\bar{f}_i^v(T,P,y_i)}{y_iP}\right] = \frac{1}{RT}\int_{V=\infty}^{V}\left[\frac{RT}{V} - \left(\frac{\partial P}{\partial N_i}\right)_{T,V,N_{i\neq j}}\right]dV - \ln Z \tag{2.1}$$

In this equation V is the total volume, and Z is the compressibility factor. For the evaluation of liquid fugacity, the following equation is used.

$$\bar{f}_i^l(x_i,T,P) = x_i\gamma_i(T,P,x_i)f_i^l(T,P) \tag{2.2}$$

where $\bar{f}_i^l(T,P)$ is the fugacity of component 'i' in liquid mixture, $f_i^l(T,P)$ is the fugacity of the pure component 'i' as a liquid at the temperature and pressure of the mixture and γ_i is the activity coefficient of component 'i' obtained from activity coefficient models.

Numerous activity coefficient models are available such as two-constant Margules, van Laar, Wilson (1964), UNIQUAC (Abrams and Prausnitz, 1975), and three-constant NRTL (Renon and Prausnitz, 1968) model. The UNIFAC (Fredenslund et al. 1977) and

ASOG (Kojima and Tochigi, 1979) are the two most important group contribution models for activity coefficients, but UNIFAC model, being applicable to the largest number of compounds, is most commonly used. UNIFAC group assignment has been developed (Hansen et al., 1991, Kleiber, 1994; 1995) to describe all the various forms of halogenated alkanes. In order to achieve better reproductions of VLE and excess enthalpies, Modified UNIFAC method has come to the fore during last few years (Gmehling et al., 1993) and its parameters have been improved recently (Kleiber and Axmann, 1998). The main advantages of the Modified UNIFAC method are a better description of the temperature dependence and the real behavior in the dilute region, and that it can be applied more reliably for systems involving molecules very different in size.

An advantage of the γ-ϕ method is that very nonideal mixtures can be described because an activity coefficient model, with suitable values of its parameters, can give very large excess Gibbs free energies of mixing. However, there are also important disadvantages of the γ-ϕ method. In particular, because a different model is being used for the vapor and liquid phases, this method is inapplicable for properly describing critical region behavior. The γ-ϕ method is not useful for the description of mixtures containing supercritical components. So usually EOS modeling is preferred because it is applicable over a wide range of temperatures and pressures. In contrast to γ-ϕ method, other thermodynamic properties, such as densities, enthalpies etc., which are important in refrigeration design, can also be obtained from EOS model.

2.2 VLE MODELING USING EQUATION OF STATE MODELS

Equations of state have played a central role in the thermodynamic modeling of VLE calculations, especially at moderate and high pressures. In the ϕ-ϕ approach of VLE calculation, an equation of state is used to describe both the vapor and liquid phases. More over, VLE calculations using an EOS can be performed within a corresponding states framework. Pitzer's three-parameter corresponding states (CS) principle has been used extensively for the prediction of volumetric and thermodynamic properties. Since the calculation of derived properties and phase equilibria requires differentiation and integration

of the compressibility function and often involves iterative calculations, it is desirable to have the correlations in analytic form as presented by Lee and Kesler (1975) for use on a computer. However, both the tabular correlation of Pitzer et al. (1955) and the analytical representation by Lee and Kesler retain Pitzer's original idea of a Taylor series expansion of a property about its value for a simple spherical fluid. Later it was showed (Teja et al., 1981) that this requirement can be relaxed so that two nonspherical fluids may be used as reference fluids. Wong et al. (1984a,b) suggested that, given a set of mixing rules, GCSP with only cubic equations as reference fluids equations of state is, for nonpolar fluids, as good as conventional corresponding states methods that use more complicated but fixed reference equations, and better for mixtures containing polar compounds. They showed that use of complicated reference equations does not improve VLE correlations to any significant extent. EOS of any form and complexity can be used as reference equations if necessary, though cubic equations are sufficient in many cases. Accuracy of VLE calculation is largely determined by the mixture model, although the effect of choosing the proper reference fluid is not negligible in all cases.

2.3 EOS-G^E MODELING

EOS modeling can be extended to mixtures with the use of proper mixing rules. For relatively simple mixtures, it is common to use van der Waals one fluid mixing rules. But even with parameters such as acentric factor or compressibility factor (Lee and Sun, 1992), the van der Waals (vdW) mixing rules cannot accurately represent mixtures containing polar and associating compounds. Growing number of new refrigerant mixtures, including alcohol-containing mixtures (Laugier et al., 1994), and increased ranges of temperature and pressure of interest, resulted in the development of EOS-G^E modeling. The transformation of phase equilibrium modeling from activity coefficient models to EOS model is largely the result of the mixing rule that allows the use of liquid excess Gibbs free energy (or, equivalently activity coefficient) models in the EOS formalism. Mixing rules that combine EOS with liquid excess Gibbs free energy (EOS-G^E) models are more suitable for the thermodynamic description of mixtures exhibiting strong nonidealities. EOS-G^E model offer much greater flexibility, extrapolation capability, and reliability of predictions than the conventional EOS models. In recent years, especially since 1990, there has been a tremendous increase in the

number and application of such models. An important characteristic of the EOS-G^E combinations is their use as predictive rather than only correlative models for phase equilibria.

EOS-G^E approach is based on the equality between the excess Gibbs (G^E) or Helmholtz (A^E) free energies from an EOS and that from an activity coefficient model. Since the excess Gibbs and Helmohltz free energies of mixing computed from an EOS are a function of pressure, and activity coefficient models are pressure independent, the equality between G^E (or A^E) from the two models can be done at a single pressure. So there are two categories of EOS-G^E models; those that make the link at infinite pressure and those that make the link at low or zero pressure.

The first successful attempt at combining an EOS and a free energy model was demonstrated by Huron and Vidal (1979), who matched the G^E from an EOS to that from an activity coefficient model at infinite pressure. However their mixing rule has not become widely used because the available G^E parameters at low pressure can not be used in their mixing rules. Moreover, this mixing rule does not satisfy the low-density boundary condition that the second viral coefficient be quadratic in composition.

The Wong-Sandler (Wong and Sandler, 1992) mixing rule is also based on the idea of equating free energies at infinite pressure, but makes use of the excess Helmholtz free energy of mixing rather than excess Gibbs free energy. This mixing rule satisfies the two known boundary conditions that at low pressures the EOS should produce a second viral that is quadratic in composition, and at high densities the EOS should behave like an activity coefficient model. The original paper has been followed by a number of publications by Sandler and his coworkers including Wong et al. (1992), Pividal et al. (1992), Orbey et al. (1993), Huang et al. (1994), Orbey and Sandler (1995a-d; 1996; 1997) and Shiflett and Sandler (1998).

The idea of equating free energies at zero pressure was originally suggested by Mollerup (1986). Since then mixing rules based on zero pressure approach have been gaining

importance. Michelson mixing rules, called MHV1 and MHV2 (Michelsen, 1990a,b; Dahl and Michelsen, 1990; and Dahl et al., 1991) are modifications of Huron-Vidal model and are based on the zero pressure reference approach. Recently, Tochigi et al., (1994) have proposed a modified Huron-Vidal mixing rule consistent with the second viral coefficient boundary condition. This mixing rule is shown to be approximately equivalent in accuracy to MHV1 mixing rule (Orbey and Sandler, 1995a). Heidemann and Kokal (1990) also developed a zero pressure based mixing rule, which is a complicated model as compared to other models.

Boukouvalas et al. (1994) proposed a new mixing rule by forming a linear combination of Huron-Vidal and Michelsen models. Though the predictive accuracy is good for asymmetric systems, as pointed out by Coutinho et al. (1994), this model has no explicit reference pressure and lacks theoretical justification.

Orbey and Sandler (1995d) tested the temperature extrapolation capabilities of the conventional vdW and the multi-parameter mixing rules for a cubic equation of state to predict the VLE behavior of some CFC, HCFC, and fluorinated alcohol binary mixtures. The multi-parameter mixing rules considered were the three-parameter mixing rule of Wong and Sandler (1992), a two-parameter empirical mixing rule introduced by Stryjek and Vera (1986b) and various other investigators (Adachi and Sugie, 1986; Panagiotopoulos and Reid, 1986) and then developed into a multi-parameter form by Schwartzentruber and Renon (1989), and a new form of a two-parameter modified Huron-Vidal mixing rule (Orbey and Sandler, 1995a). Of particular interest was determining how well these models could correlate experimental data at a single temperature, and then how each could predict phase behavior at other temperatures with temperature independent parameters. The results indicate that for some new refrigerant mixtures only the excess free energy based equation of state mixing rules (Wong and Sandler, 1992; Orbey and Sandler, 1995a) can provide acceptable correlations, and also reasonable predictions over a wide range of temperatures. While all the models considered performed well for conventional refrigerant mixtures, only the excess free energy based models consistently led to accurate predictions over a wide ranges of

temperature; the other models resulted in less accurate predictions and, in some cases, false liquid-liquid splitting.

Zhong and Masuoka (1996) proposed a modified form of MHV1 model, which is called MR1 model. This model is a phenomenal modification of MHV1 mixing rule where an adjustable parameter is introduced and is relevant for gas-large alkane systems. They also proposed another mixing rule called MR2 mixing rule, where the conventional linear mixing rule for b_m in MHV1 is replaced by a mixing rule for a_m/b_m.

Ioannidis and Knox (1997) have presented a single energy parameter model for several traditionally used and recently proposed refrigerant mixtures based on the Wong-Sandler mixing rule. The solution model used is a modification of G^E model based on the work of Knox et al. (1984), that assigns one energy and one size related parameter per binary mixture. The systems studied include fluorocarbons (FCs), CFC, and HCFC mixtures and CFC/HCFC-hydrocarbon mixtures.

Shiflett and Sandler (1998) have modeled seven binary fluorocarbon mixtures forming azeotropes using the Wong-Sandler mixing rules with nonrandom-two liquid (NRTL) activity coefficient model. The azeotropes consisted of binary mixtures of HFCs, FCs, CO_2, NH_3, and propane. These azeotropes demonstrate a variety of nonideal behavior including polar/polar, polar/nonpolar, and nonpolar/nonpolar interactions, and in some cases large molecular size differences.

Recently, Scalabrin et al. (2000) have proposed a new mixing rule in three-parameter corresponding states framework. Their model maintains a very similar structure to Teja (1980), in which a new scaling factor δ-based on saturated liquid density alone- substitutes Pitzer's acentric factor. In contrast to other conventional EOS-G^E models, this model does not make any limiting assumption about the pressure variable, which is maintained at its real value. They have selected first reference fluid as Argon, a simple non-polar fluid; the second is the refrigerant R134a, a polar fluid. For both Argon and R134a, high-accuracy dedicated EOS, formulated in Helmholtz free-energy terms have been used. In this work data

regression is focused in determining the function T_{cmix}, avoiding the introduction of any formal structure for it. Isothermal VLE were calculated using both correlative and predictive modes. UNIFAC model is used for calculation of activity coefficient in predictive mode.

All the models mentioned above can be useful for correlation and prediction at some conditions though problems may arise at other conditions. In principle, these models are not restricted to VLE and are applicable to all other phase equilibrium problems.

CHAPTER 3
THERMODYNAMIC MODELING

3.1 CRITERION FOR VAPOR-LIQUID EQUILIBRIUM

The general constraint for VLE is

$$\bar{f}_i^l(x_i, T, P) = \bar{f}_i^v(y_i, T, P) \tag{3.1}$$

where $\bar{f}_i$ is the fugacity of species i in a homogeneous liquid or vapor mixture, superscripts l and v represent liquid and vapor phases, respectively. Also T and P are absolute temperature and pressure and x_i and y_i are the mole fractions of species 'i' in liquid and vapor phases, respectively.

In the EOS approach the equilibrium constraint of eqn (3.1) is used with same EOS for both phases and can be represented in terms of fugacity coefficients as shown below.

$$x_i\bar{\phi}_i^l(T, P, x_i)P = y_i\bar{\phi}_i^v(T, P, y_i)P \tag{3.2}$$

3.2 GENERALIZED CORRESPONDING STATES PRINCIPLE

The generalized corresponding states principle (Teja, 1980) is based on the choice of two reference fluids having a *conformal* thermodynamic behavior with the fluid or fluid mixture of interest, and for which the equations of state are known. The corresponding states relation of the fugacity coefficient is then written as:

$$\ln\phi(T_r, P_r) = \ln\phi_1(T_r, P_r) + \frac{\theta - \theta_1}{\theta_2 - \theta_1}\left[\ln\phi_2(T_r, P_r) - \ln\phi_1(T_r, P_r)\right] \tag{3.3}$$

Subscripts 1 and 2 represent the reference fluids for which EOS in the $P = P(\rho, T)$ or equivalent functional form is available and θ is some characterizing property known as scaling factor.

Criteria to be satisfied in the selection of reference fluids are

1. $\phi(\theta)\big|_{T_r, P_r}$ is a linear function of θ for reference fluids and fluid of interest;
2. reference fluids should have a precise EOS;
3. the validity of the EOS has to be as wide as the range of interest of the fluid to represent;
4. they have to be in the same phase approximately in the same condition as that of the fluid to represent.

In this work first reference fluid selected is Argon, a simple non-polar fluid; the second is the refrigerant R134a, a polar fluid belonging to the same family as the fluids being analysed. These are realized to be the best ones as reference fluids for refrigerant mixtures (Scalabrin et al., 2000).

Present work uses the following two scaling factors.

1. Pitzer's acentric factor, defined as;

$$\omega_i = -\log_{10}\left[\frac{\left(P_r^s\right)_i}{\left(P_r^s\right)_{ng}}\right]_{T_r=0.7} \tag{3.4}$$

   where i indicates the fluid of interest and ng a noble gas (Ar, Kr, Xe), usually taken as Ar. P_r^s is the reduced saturation pressure.

2. new scaling factor δ, defined as

$$\delta_i = \log_{10}\left[\frac{\left(\rho_r^s\right)_i}{\left(\rho_r^s\right)_j}\right]_{T_r=0.8} \tag{3.5}$$

where i and j represents fluid of interest and reference fluid (R12), respectively, while ρ_r^s is the reduced saturated liquid density.

One of the most important applications of GCSP is in the calculation of mixture properties. The extension of the GCSP to mixtures is generally based on replacing the characterization parameters T_c, P_c and θ with appropriate pseudocritical parameters T_{cmix}, P_{cmix} and θ_{mix}, which mainly depend on composition of the mixture and are calculated by proper choice of mixing models. The extended GCSP form for mixtures can be written as:

$$\ln\phi_{mix}(T_r, P_r, z_i) = \ln\phi_1(T_r, P_r) + \frac{\theta_{mix} - \theta_1}{\theta_2 - \theta_1}\left[\ln\phi_2(T_r, P_r) - \ln\phi_1(T_r, P_r)\right] \tag{3.6}$$

where z_i is used as a generic mole fraction term; when applied to liquid phase, x_i is substituted for z_i, and for the vapor phase y_i is used instead.

This work concentrates only on binary mixtures and when GCSP is applied to binary mixtures using pure components of the mixture as reference fluids scaling factors are not required. In such a case, GCSP can be formulated as

$$\ln\phi_{mix}(T_r, P_r, z_1) = z_1 \ln\phi_1(T_r, P_r) + (1 - z_1)\ln\phi_2(T_r, P_r) \tag{3.7}$$

Fugacity coefficients of the reference fluids are calculated using the equation given below.

$$\ln\phi_i(T, P) = \ln\left[\frac{f_i\ (T,P)}{P}\right] = \frac{1}{RT}\int_{V=\infty}^{V}\left[\frac{RT}{V} - \left(\frac{P}{N_i}\right)\right]dV - \ln Z + (Z - 1) \tag{3.8}$$

A suitable cubic equation of state is used for all pure components for the solution of eqn. (3.8). The expression used for the fugacity coefficient of species 'i' in a mixture is given by

$$\ln \bar{\phi}_i = \ln \phi_{mix} + (1 - z_i) \frac{\partial \ln \phi_{mix}}{\partial z_i}\bigg|_{T,P,z_j} \tag{3.9}$$

Peng-Robinson equation of state used in the solution of eqn (3.8) is

$$P = \frac{RT}{v-b} - \frac{a(T)}{v(v+b)+b(v-b)} \tag{3.10}$$

$$a(T) = \left(0.457235 \frac{R^2 T_c^2}{P_c}\right) \alpha(T) \tag{3.11}$$

$$b = 0.077796 \frac{RT_c}{P_c} \tag{3.12}$$

For reference fluid R134a and for all pure components of the mixture, temperature dependence of the α term proposed by Stryjek and Vera is used

$$\alpha(T) = \left[1 + \kappa(1 - \sqrt{T/T_c})\right]^2 \tag{3.13}$$

$$\kappa = \kappa_0 + \kappa_1 (1 + T_r^{0.5})(0.7 - T_r) \tag{3.14}$$

$$\kappa_0 = 0.378893 + 1.4897153\omega - 0.17131848\omega^2 + 0.0196554\omega^3 \tag{3.15}$$

and κ_1 is a substance specific parameter.

Problems arise in the above functional form of α when dealing with a fluid whose critical temperature is low. So for Argon a new α function (Twu et al., 1995) is used as given below;

$$\alpha = T_r^{N(M-1)} e^{L(1-T_r^{NM})} \tag{3.16}$$

where L=0.036512; M=0.935460; N=3.97643.

Combining eqn. (3.8) and (3.10) we get

$$\ln\phi = Z - 1 - \ln(Z - B) - \frac{a}{2\sqrt{2}bRT}\ln\left\{\frac{Z + B(1+\sqrt{2})}{Z + B(1-\sqrt{2})}\right\} \tag{3.17}$$

where Z is obtained from eqn. (3.10) rearranged as

$$Z^3 - (1-B)Z^2 + (A - 3B^2 - 2B)Z - (AB - B^2 - B^3) = 0 \tag{3.18}$$

$$A = \frac{aP}{(RT)^2} \tag{3.19}$$

$$B = \frac{bP}{RT} \tag{3.20}$$

3.3 MIXING RULES

The different steps proposed here consist of developing a mixing rule, which incorporates a G^E model under *actual* temperature and pressure conditions. In this procedure, there is no limitation of applying the mixing rules at a reference pressure (i.e., $P \to 0$, or $P \to \infty$). Various steps involved in the development of the mixing rules are given below.

1. Following the classical procedure, to obtain T_r and P_r, it is customary to use conventional mixing rules providing the required pseudocritical T_{cmix} and P_{cmix} parameters in analytical form as functions of composition. In this work, following Scalabrin et al. (2000), the rules proposed by Wong et al. (1983) were selected and modified as follows:

$$\frac{T_{cmix}}{P_{cmix}} = \sum_i \sum_j z_i z_j \frac{T_{cij}}{P_{cij}} \tag{3.21}$$

$$\frac{T_{cmix}^2}{P_{cmix}} = \sum_i \sum_j z_i z_j \frac{T_{cij}^2}{P_{cij}} \tag{3.22}$$

$$T_{cij} = \varepsilon_{ij}\sqrt{T_{ci}T_{cj}} \tag{3.23}$$

$$P_{cij} = \frac{8T_{cij}}{\eta_{ij}\left[(T_{ci}/P_{ci})^{1/3} + (T_{cj}/P_{cj})^{1/3}\right]^3} \tag{3.24}$$

The two unknown parameters T_{cmix}, P_{cmix} and eqns. (3.21) and (3.22) make a determined system that can be solved for each value of the composition x_i using eqns (3.23) and (3.24) for the cross terms, T_{cij} and P_{cij}.

For the θ_{mix} term the following relation is used:

$$\theta_{mix} = \sum_i z_i \theta_i \tag{3.25}$$

The two interaction parameters ε_{ij} and η_{ij} in eqns (3.23) and (3.24) of the original mixing rules could be regressed on experimental data. However, for greater flexibility, ε_{ij} and η_{ij} have been set to 1.

2. $\dfrac{G^E}{RT} = \sum_i x_i \ln \gamma_i$; where γ_i is calculated from experimental data for correlative method, and UNIFAC and Modified UNIFAC are used for the predictive method.
3. Keeping P_{cmix} and δ_{mix} from step 1 as such and changing the values of T_{cmix} iteratively solve the relation given below :

$$\frac{G^E}{RT} = \ln \phi^l_{mix}(T_{cmix}) - \sum x_i \ln \phi^l_i \tag{3.26}$$

i.e. obtain the value of T_{cmix} for which above equation is satisfied. Repeating this computational procedure for all points in the selected dataset, a corresponding set of T_{cmix} values is obtained. The T_{cmix} values generated are then correlated for the system of interest, providing the new mixing rule $T_{cmix}(T, P, x_i)$. Because the system is solved in VLE conditions the pressure variable is the corresponding bubble pressure $P = P^S(T, x_i)$ and the mixing rule is reduced to $T_{cmix}(T, x_i)$

4. Consequently, a $T_{cmix}(T, x_i)$ form can be regressed through a minimization technique, after the choice of a suitable analytical form. The analytical form used in this work for fitting the generated T_{cmix} values, for both correlative and predictive

modes, is a polynomial of second order in x_i and T with six parameters as shown below. But such a choice is not obligatory and other forms can also be selected.

$$T_{cmix}(T, x_i) = a + bx + cT + dx^2 + eT^2 + fxT \tag{3.27}$$

5. In correlative method T_{cmix} values obtained in above step is used for calculating γ_i from experimental data and the above steps are repeated until convergence on T_{cmix} is achieved. In predictive mode, since γ_i is calculated from activity coefficient models, this step is not required.

Steps for calculating γ_i from experimental data (T, P, x_i, y_i) is described below. From basic thermodynamic relations, we have

$$\gamma_i^l = \frac{\hat{\phi}_i^l}{\phi_i} \tag{3.28}$$

VLE condition is given by

$$\hat{\phi}_i^l x_i = \hat{\phi}_i^v y_i \tag{3.29}$$

Combining the above two equations

$$\gamma_i^l = \frac{\hat{\phi}_i^v y_i}{\phi_i x_i} \tag{3.30}$$

a. Calculate ϕ_i^l for pure fluid using the equation

$$\ln\phi_i^l(T_r, P_r) = \ln\phi_1^{\,l}(T_r, P_r) + \frac{\theta_i - \theta_1}{\theta_2 - \theta_1}\left[\ln\phi_2^{\,l}(T_r, P_r) - \ln\phi_1^{\,l}(T_r, P_r)\right] \tag{3.31}$$

b. Calculate $\hat{\phi}_i^v$ for the component in the mixture using equations (3.6) & (3.9).

c. γ_i is calculated using eqn. (3.26)

3.4 ACTIVITY COEFFICIENT MODELS

UNIFAC model

The UNIquac Functional-group Activity Coefficient (UNIFAC) model can be written as

$$\ln \gamma_i = \ln \gamma^{comb} + \ln \gamma^{res} \tag{3.32}$$

The combinatorial part ($\ln \gamma^{comb}$) depends on volume and surface area of the molecules and attempts to describe the dominant entropic contribution. The residual part ($\ln \gamma^{res}$) accounts mainly for the effects which arise from the energetic interactions between groups that are responsible for the enthalpy of mixing.

The expression for the combinatorial part is given by

$$\ln \gamma_i^{comb} = \ln \frac{\phi_i}{x_i} + \frac{z}{2} q_i \ln \frac{\theta_i}{\phi_i} + l_i - \frac{\phi_i}{x_i} \sum_j x_j l_j \tag{3.33}$$

where $$l_i = \frac{z}{2}(r_i - q_i) - (r_i - 1) \tag{3.34}$$

z is the coordination number which is usually equal to 10.

r_i and q_i are the structural parameters and are calculated as the sum of the group volume and area parameters R_K and Q_K, respectively.

$$r_i = \sum_k v_k^{(i)} R_k \tag{3.35}$$

$$q_i = \sum_k v_k^{(i)} Q_k \tag{3.36}$$

where $v_k^{(i)}$ is the number of groups of type k in a molecule of component i.

The segment or volume fraction of component 'i' is given by

$$\phi_i = \frac{x_i r_i}{\sum_j x_j r_j} \tag{3.37}$$

The area fraction of component 'i' is given by

$$\theta_i = \frac{x_i q_i}{\sum_j x_j q_j} \tag{3.38}$$

The expression for the residual part is given by

$$\ln \gamma_i^{res} = \sum_k v_k^{(i)} \left(\ln \Gamma_k - \ln \Gamma_k^{(i)} \right) \tag{3.39}$$

where $$\ln \Gamma_k = Q_k \left[1 - \ln \left(\sum_m \theta_m \psi_{mk} \right) - \sum_m \frac{\theta_m \psi_{km}}{\sum_n \theta_n \psi_{nm}} \right] \tag{3.40}$$

The surface area fraction of group m is given by the expression

$$\theta_m = \frac{Q_m X_m}{\sum_n Q_n X_n} \tag{3.41}$$

and

$$\psi_{mn} = \exp\left(-\frac{a_{mn}}{T} \right) \tag{3.42}$$

X_m is the mole fraction of group m in the mixture, Γ_k is the group residual activity coefficient and $\Gamma_k^{(i)}$ is the residual activity coefficient of group k in a reference solution containing only molecules of type i. The equation (3.40) is used to calculate $\Gamma_k^{(i)}$ also.

Modified UNIFAC model

The main difference between UNIFAC and modified UNIFAC results from the representation of the UNIFAC group interaction parameters a_{mn} as a quadratic polynomial in T.

$$a_{mn} = \alpha_{mn} + \beta_{mn} T + \delta_{mn} T^2 \tag{3.43}$$

Thus expression of eqn. (3.42) is replaced by the following expression proposed by Holderbaum and Gmehling (1991).

$$\psi_{mn} = \exp\left(-\frac{\alpha_{mn} + \beta_{mn}T + \delta_{mn}T^2}{T}\right) \tag{3.44}$$

Here α_{mn}, β_{mn} and δ_{mn} are the group interaction parameters, $\alpha_{mn} \neq \alpha_{nm}, \beta_{mn} \neq \beta_{nm}$, and $\delta_{mn} \neq \delta_{nm}$

The Modified UNIFAC (Dortmund) used in this work also comprises of a slightly modified combinatorial part of activity coefficient given by

$$\ln\gamma^{comb} = 1 - \phi_i^* + \ln\phi_i^* - \frac{z}{2}q_i\left(1 - \frac{\phi_i}{\theta_i} + \ln\frac{\phi_i}{\theta_i}\right) \tag{3.45}$$

where

$$\phi_i = \frac{r_i}{\sum_j x_j r_j} \tag{3.46}$$

$$\theta_i = \frac{q_i}{\sum_j x_j q_j} \tag{3.47}$$

$$\phi^*_i = \frac{r_i^{0.75}}{\sum_j x_j r_j^{0.75}} \tag{3.48}$$

In this work, for VLE calculation conventional ϕ-ϕ procedure has been used, for given temperature T and liquid composition x_i values, to solve the bubble point determination of the equilibrium pressure and vapor phase composition y_i. Isothermal bubble pressure algorithm is shown in Fig. 3.1.

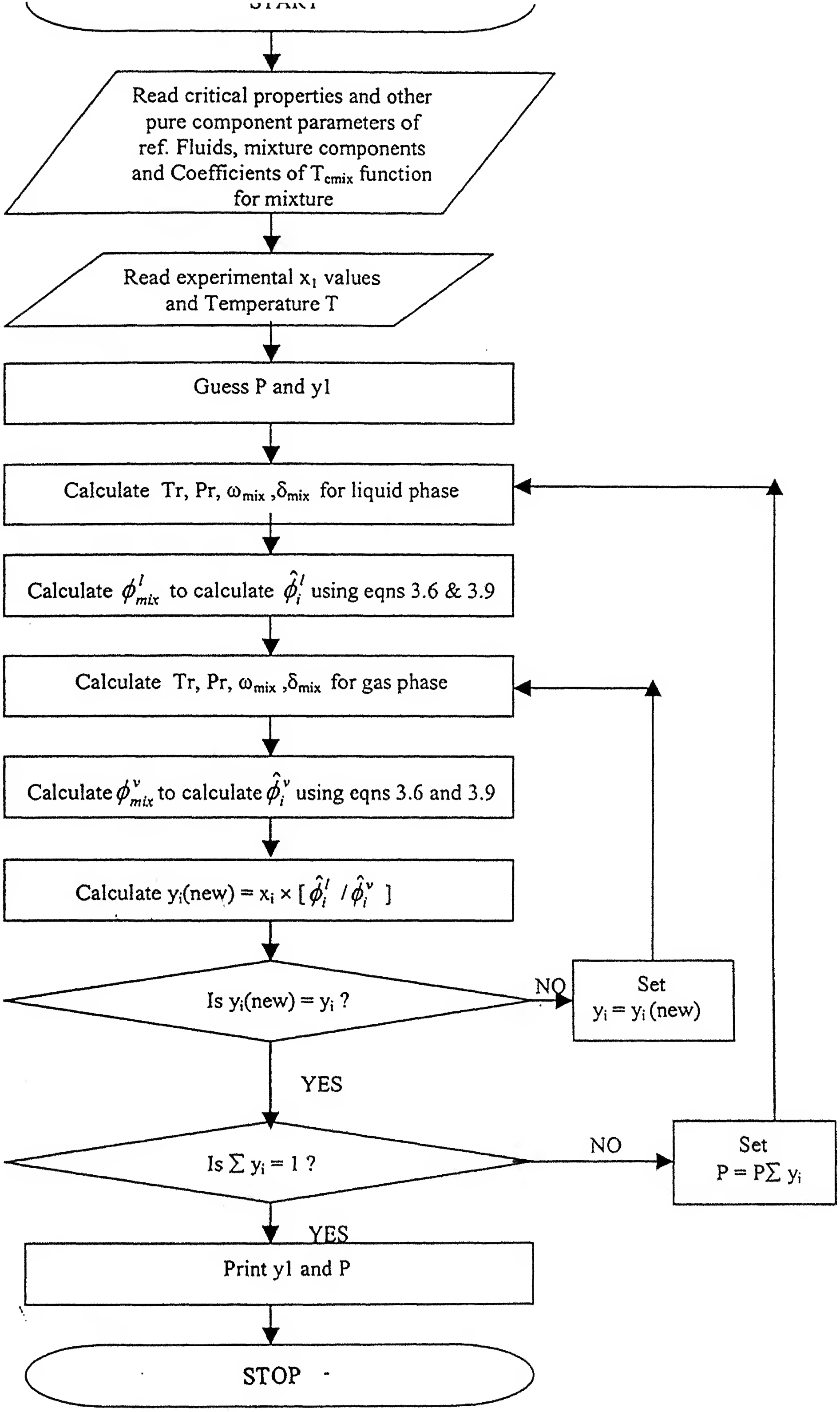

Figure 3.1 Isothermal Bubble Pressure algorithm

CHAPTER 4

RESULTS AND DISCUSSION

4.1 PURE COMPONENT PROPERTIES, PARAMETERS AND MIXTURE VLE DATA

Critical properties T_c and P_c, acentric factor ω, saturated liquid density based scaling factor δ, PRSV equation parameter κ_1, used in the study are given in Table 4.1. Literature sources for isothermal VLE data for all the binary refrigerant mixtures studied in this work are provided in Table 4.2.

4.2 RESULTS AND DISCUSSION

Isothermal vapor-liquid equilibrium (VLE) behavior of 30 binary refrigerant mixtures were studied in this work, out of which nine are azeotropic mixtures. Deviations in calculated vapor composition and calculated bubble pressure from experimental data are taken as the Objective Function in this work.

Results of the Objective Function for the calculated bubble pressure are expressed as a percentage of the Absolute Average Deviation (%AAD) defined in the conventional way

$$\%AAD = \frac{1}{N}\sum_i \left(\frac{\left| P_{\exp_i} - P_{calc_i} \right|}{P_{\exp_i}} \right) 100 \qquad (4.1)$$

where N is the number of data points, P_{exp}, P_{calc} are the experimental and calculated values, respectively.

The objective function used for the calculated vapor phase composition is expressed in terms of the error deviation $\overline{\Delta y}$ defined as follows:

$$\overline{\Delta y} = \frac{\sum_{i}^{N} \left| y_{calc_i} - y_{\exp_i} \right|}{N} \tag{4.2}$$

The results obtained for each point in each isotherm, experimental and calculated bubble pressures and vapor compositions are presented in Tables 4.3 through 4.92 along with percentage absolute average deviation in pressure and error deviation in vapor composition. For each system three tables are given; in the first table results are calculated using saturated liquid density based scaling factor (δ) in GCSP, the second table is based on acentric factor (ω) as scaling factor, and in the third one results are obtained using pure components of the mixture as reference fluids. Reference fluids used in the first two cases are Argon and R134a. In each table results are calculated in three ways, predictive mode using UNIFAC, predictive mode using Modified UNIFAC and correlative mode. The graphical representations of VLE for all the systems studied are shown in Figs. 4.1 through 4.89. The results and analysis show the relative capabilities of different models in describing the VLE behavior of different binary refrigerant mixtures.

Examining the results obtained, it appears that the correlative mode reaches good accuracy level in all the ways. On comparing the results obtained using pure components as reference fluids, with the results obtained using reference fluids as Argon and R134a with scaling factor ω, it can be seen that most of the systems give almost same results for same mode (correlative or predictive) of calculation. In case of systems R22-R142b, R32-R125, R32-R143a, R32-R227ea, R32-R236ea, R125-R290 and R125-R600a at high temperature and pressures, difficulties have been encountered in converging when calculations are done using 'Ar' and 'R134a' as reference fluids and pure components of mixture as reference fluids. In many systems (R32-R134a, R32-R142b, R32-R290, R125-R236ea, R134a-R227ea, R143a-R134a, R143a-R152a, R143a-R236fa, R227ea-R600a and R290-RR236ea) difficulties are encountered at high temperatures and pressures only when calculations are done using pure components as reference fluids. One possible

reason is that during the convergence procedure of T_{cmix} calculation or VLE calculation, the reference fluids equation of state are used outside their validity range.

In predictive mode, results obtained with UNIFAC and M-UNIFAC models, using scaling factor δ, is compared with the results obtained in UNIFAC and M-UNIFAC models, using scaling factor ω. Results obtained using acentric factor are similar to that obtained using pure components as reference fluids in both G^E models.

In systems like R22-R114, R22-R142b and R125-R134a, accuracy of the results obtained are fairly good irrespective of the scaling factor of GCSP and G^E model (UNIFAC and M-UNIFAC). Results for the systems R12-R114 and R125-R236ea, though not very good, are acceptable and it is difficult to differentiate between different models for these systems since the results are almost similar.

In predictive mode using UNIFAC model, for systems R32-R125, R32-R236ea, and R143a-R236fa, the results obtained with acentric factor are very good. Results for the systems R32-R134a and R290-R236ea using acentric factor are better when compared with the results obtained using other methods. Results for R125-R152a and R125-R290 systems calculated with δ in GCSP are better than that obtained from other methods.

In predictive mode using M-UNIFAC model, for systems R32-R142b, R32-R143a, R125-R600a and R600a-R236fa results obtained with acentric factor are very good. Fairly good results also are obtained for the system R32-R290 using acentric factor, while use δ gives good results for the system R32-R227ea. Excellent results are obtained for systems R134a-R124 and R134a-R142b both with the use of ω and δ.

Acceptable results are obtained for R134a-R152a system using δ with both UNIFAC and M-UNIFAC. Excellent results are obtained for systems R124-R142b, R134a-R227ea, R134a-R236fa, R143a-R134a and R143a-R152a using ω with both UNIFAC and M-UNIFAC, although UNIFAC is slightly better than M-UNIFAC except for R143a-R152a.

Except for azeotropic systems like R134a-R12, R134a-R290, R134a-R600a and R227ea-R600a, excellent results are obtained in predictive mode for a large number of systems like R22-R114, R22-R142b, R32-R142b, R32-R143a, R32-R236ea, R125-R134a, R125-R600a, R134a-R124, R134a-R142b, R134a-R152a, R134a-R227ea, R134a-R236fa, R143a-R134a, R143a-R152a, R143a-R236fa. From the results obtained in predictive mode, it can be seen that, in general, the accuracy level reached using ω in the GCSP is significantly higher than that resulting from the use of saturated liquid density based scaling factor δ and for majority of systems comparatively better results are obtained with UNIFAC than with M-UNIFAC, although for some systems the difference is only marginal.

Possible reasons for very poor results shown by certain mixtures can be due to weak effect of the G^E models in tuning the mixing rule or the reference fluids selected may not be conformal with the mixture considered.

Table 4.1 Critical Properties and Pure Component Parameters

Fluid	Chemical Formula	IUPAC Name	T_c (K)	P_c (MPa)	ω	δ $\times10^{-2}$	κ_1 $\times10^{-2}$	References
Argon	Ar	Argon	150.687	4.863	0.0000	-3.8120	-	Scalabrin et al. (2000)
R12	CCl_2F_2	Dichlorodifluoro methane	385.12	4.136	0.1801	0.0000	4.7220	Cristofoli et al.(2000), Scalabrin et al. (2002), Proust and Vera (1989)
R22	$CHClF_2$	Chlorodifluoro methane	369.28	4.988	0.2191	2.0648	1.3753	Cristofoli et al. (2000), Ioannidis and Knox (1997), Chen and Wu.
R32	CH_2F_2	Difluoromethane	351.35	5.795	0.2768	8.6266	-4.4000	Cristofoli et al.(2000), Park et al.,(2001), Shifflet and Sandler (1998)
R114	CF_2ClCF_2Cl	1,2-Dichloro-1,1,2,2-trifluoroethane	418.80	3.250	0.2523	1.0341	6.0950	Scalabrin et al. (2000,2002), Proust and Vera (1989)
R124	$CHClFCF_3$	1-Chloro-1,2,2,2-tetrafluoroethane	395.62	3.637	0.2860	2.0172	1.0926	Cristofoli et al.(2000), Lee et al. (1996), Chen and Wu.
R125	CHF_2CF_3	Pentafluoroethane	339.40	3.629	0.3035	2.3256	0.1600	Cristofoli et al.(2000), Shiflett and Sandler (1998), Lee et al. (2000)
R134a	CF_3CH_2F	1,1,1,2-Tetrafluoroethane	374.18	4.059	0.3268	4.3659	0.4409	Cristofoli et al.(2000), Chen and Wu, Lim et al. (2001)
R142b	CF_2ClCH_3	1-Chloro-1,1-difluoroethane	410.29	4.041	0.2300	2.4550	4.4000	Cristofoli et al.(2000), Pandey, K.K., (2000), Lee et al. (1996)
R143a	CF_3CH_3	1,1,1-Trifluoroethane	346.75	3.780	0.2611	5.0505	-2.4000	Cristofoli et al.(2000), Shiflett and Sandler (1998), Lim et al. (2002b)
R152a	CHF_2CF_3	1,1-Difluoroethane	386.41	4.516	0.2752	6.0131	-0.7470	Scalabrin et al. (2000), Chen and Wu, Park et al, (2001)
R227ea	CF_3CHFCF_3	1,1,1,2,3,3,3-Heptafluoropropane	375.95	2.943	0.3632	2.2878	9.7900	Cristofoli et al.(2000), Lee et al. (2000),Park et al. (2001)
R236ea	$CF_3CHFCHF_2$	1,1,12,3,3-Hexafluoropropane	412.44	3.501	0.3794	1.7128	-8.4720	Cristofoli et al.(2000), Chen and Wu, Nicola and Polanara (2001b)
R236fa	$CF_3CH_2CF_3$	1,1,1,3,3,3-Hexafluoropropane	398.07	3.200	0.37782	3.0784	0.5400	Cristofoli et al.(2000), Pandey, K. K (2000), Nicola and Polanara (2001a)
R290	$CH_3CH_2CF_3$	Propane	369.80	4.242	0.1523	-0.0840	3.1360	Scalabrin et al. (2000,2002), Stryjek and Vera (1986a)
R600a	C_4H_{10}	Isobutane	407.85	3.640	0.1853	0.3399	-0.2380	Scalabrin et al. (2002,2002), Proust and Vera (1989)

Table 4.2 Literature sources of experimental VLE data for binary mixtures of Refrigerants

Sl. No.	System	No. of data points	T (K)	P Range (MPa)	References
1	R12 (1) / R114 (2)	5	253.15	0.057-0.135	Kubota et al. (1990a)
		10	283.15	0.180-0.394	
		10	313.15	0.387-0.896	
2	R22 (1) / R114 (2)	5	253.15	0.076-0.229	Kubota et al. (1990a)
		8	283.15	0.181-0.619	
		12	313.15	0.606-1.515	
		19	338.15	0.799-2.594	
3	R22 (1) / R142b (2)	14	263.15	0.098-0.355	Kubota et al. (1990b)
		15	273.15	0.146-0.498	
		15	283.15	0.210-0.679	
		20	293.15	0.293-0.910	
		17	313.15	0.526-1.534	
		12	338.15	0.995-2.704	
4	R32 (1) / R125 (2)	6	268.15	0.5713-0.6938	Kobayashi and Nishiumi (1998), Jung et al. (2001)
		8	273.15	0.6910-0.8180	
		6	278.15	0.7854-0.9518	
		4	283.05	0.9860-1.1150	
		6	288.15	1.0528-1.2810	
		4	293.05	1.3070-1.4650	
		6	298.15	1.3806-1.6896	
		7	303.15	1.6650-1.9410	
		6	308.15	1.7829-2.1894	
		6	318.15	2.3450-2.7710	
5	R32 (1) / R134a (2)	11	263.15	0.2516-0.5518	Shimawaki et al. (2002)
		11	273.15	0.3611-0.7701	
		9	283.15	0.5033-1.0489	
		9	293.15	0.6848-1.3966	
6	R32 (1) / 142b (2)	7	295.45	0.310-1.571	Lee et al. (1998)
		7	304.55	0.409-1.998	
		7	314.95	0.549-2.588	
7	R32 (1) / R143a (2)	9	263.15	0.4501-0.5896	Kim and Park (2000)
		9	273.15	0.6218-08164	
		9	283.15	0.8399-1.1064	
		9	293.15	1.1107-1.4739	
		9	303.15	1.4340-1.9269	
		9	313.15	1.8318-2.4810	
8	R32 (1) / 227ea (2)	9	283.15	0.2775-1.1092	Park et al. (2001), Koo et al. (2000)
		9	298.15	0.4560-1.6860	
		8	303.15	0.5303-1.9240	
		9	312.65	0.6930-2.4370	

Table 4.2 (Continued)

9	R32 (1) / 236ea (2)	11	288.55	0.1455-1.2942	Bobbo et al. (2000b)
		8	303.19	0.2452-1.9277	
		9	318.25	0.3953-2.7959	
10	R32 (1) / R290 (2)	13	248.13	0.2034-0.4661	Bobbo et al. (2002)
		16	254.15	0.2533-0.5752	
		16	273.15	0.4735-1.0527	
		17	294.91	0.8748-1.9023	
		5	293.15	0.8362-1.8197	
11	R124 (1) / R142b (2)	11	298.15	0.338-0.379	Lee et al. (1996)
		10	312.15	0.508-0.573	
12	R125 (1) / R134a (2)	6	268.15	0.254-0.544	Kobayashi and Nishiumi (1998)
		8	273.15	0.308-0.633	
		4	278.15	0.415-0.689	
		8	283.15	0.442-0.882	
		7	293.15	0.606-1.158	
13	R125 (1) / R152a (2)	7	293.15	0.514-1.207	Lim et al. (2000)
14	R125 (1) / R236ea (2)	8	288.44	0.1463-1.0600	Bobbo et al. (2000b)
		9	303.19	0.2450-1.5684	
		9	318.24	0.3949-2.2633	
15	R125 (1) / R290 (2)	5	273.15	0.4746-0.8341	Park and Jung (2002)
		5	283.15	0.6361-1.1015	
		5	293.15	0.8365-1.4320	
		5	303.15	1.0796-1.8258	
		5	313.15	1.3684-2.3058	
16	R125 (1) / R600a (2)	14	293.15	0.3045-1.2108	Lee et al. (2000)
		11	303.15	0.4070-1.5700	
		12	313.15	0.5300-2.003	
17	R134a (1) / R12 (2)	9	258.00	0.1631-0.2244	Kleiber (1994)
		9	278.00	0.3485-0.4495	
		9	298.00	0.6477-0.8132	
18	R134a (1) / R124 (2)	5	296.45	0.370-0.621	Lee et al. (1996)
		8	302.25	0.431-0.748	
		7	307.25	0.498-0.865	
19	R134a (1) / R142b (2)	9	268.00	0.1189-0.2425	Kleiber (1994)
		10	283.00	0.2066-0.4132	
		10	298.00	0.3365-0.6622	
20	R134a (1) / R152a (2)	7	255.00	0.1306-0.1438	Kleiber (1994)
		7	275.00	0.2821-0.3129	
		8	298.00	0.5936-0.6622	
21	R134a (1) / R227ea (2)	8	298.15	0.4560-0.6640	Park et al. (2001), Koo et al. (2000)
		9	303.15	0.5303-0.7700	
		9	312.65	0.6930-0.9980	
		9	323.15	0.9210-1.3201	
22	R134a (1) / R236fa (2)	8	283.62	0.1626-0.4207	Bobbo et al. (1998)
		9	303.68	0.3258-0.7809	

Table 4.2 (Continued)

23	R134a (1) / R290 (2)	8 8 10	255.00 275.00 298.00	0.1438-0.3250 0.3129-0.6244 0.6622-1.1789	Kleiber (1994)
24	R134a (1) / R600a (2)	10 16	303.68 293.66	0.4107-0.8843 0.3067-0.6696	Bobbo et al. (1998)
25	R143a (1) / R134a (2)	8 8 8 8 8 8	263.15 273.15 283.15 293.15 303.15 313.15	0.2001-0.4501 0.2924-0.6218 0.4144-0.8399 0.5718-1.1107 0.7690-1.4340 1.0145-1.8318	Kim et al. (2000)
26	R143a (1) / R152a (2)	7 7 7 8	273.15 293.15 303.15 313.15	0.2628-0.6206 0.5171-1.1070 0.6887-1.4344 0.9058-1.8270	Lim et al. (2002a)
27	R143a (1) / R236fa (2)	8 8 8	283.11 298.16 313.21	0.1609-0.8348 0.2725-1.2607 0.4393-1.8325	Bobbo and Comporese (2000)
28	R227ea (1) / R600a (2)	14 14 12	303.15 313.15 323.15	0.4070-0.6582 0.5300-0.8456 0.6832-1.0809	Lee et al. (2000)
29	R290 (1) / R236ea (2)	13 13 14	283.12 298.16 313.21	0.1186-0.6375 0.2058-0.9551 0.3404-1.3741	Bobbo et al. (2000a)
30	R600a (1) / R236fa (2)	14	303.68	0.3258-0.5354	Bobbo et al. (1998)

Table 4.3 Results of VLE Calculations for R12 (1) / R114 (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=253.15K								
0.138	0.391	0.3352	0.3456	0.3799	0.057	0.062	0.063	0.056
0.344	0.666	0.6290	0.6337	0.6642	0.078	0.085	0.086	0.080
0.493	0.782	0.7620	0.7623	0.7840	0.099	0.102	0.103	0.097
0.683	0.884	0.8788	0.8766	0.8881	0.119	0.125	0.126	0.120
0.821	0.941	0.9399	0.9379	0.9436	0.135	0.142	0.142	0.136
$\overline{\Delta y}$		0.0238	0.0216	0.0043	%AAD	5.923	7.116	1.347
T=283.15K								
0.142	0.339	0.3015	0.3096	0.3300	0.180	0.187	0.189	0.175
0.265	0.502	0.4875	0.4938	0.5154	0.206	0.220	0.224	0.210
0.426	0.676	0.6650	0.6669	0.6839	0.253	0.266	0.270	0.257
0.525	0.752	0.7487	0.7485	0.7619	0.281	0.296	0.300	0.286
0.577	0.791	0.7869	0.7858	0.7973	0.299	0.311	0.315	0.301
0.665	0.844	0.8439	0.8420	0.8505	0.327	0.338	0.341	0.328
0.776	0.906	0.9048	0.9027	0.9078	0.357	0.373	0.375	0.361
0.789	0.912	0.9113	0.9092	0.9139	0.363	0.377	0.379	0.365
0.859	0.944	0.9439	0.9421	0.9451	0.386	0.399	0.401	0.386
0.882	0.958	0.9538	0.9523	0.9547	0.394	0.406	0.408	0.393
$\overline{\Delta y}$		0.0077	0.0071	0.0061	%AAD	4.366	5.372	1.115
T=313.15K								
0.061	0.152	0.1248	0.1293	0.1356	0.387	0.405	0.407	0.386
0.076	0.178	0.1531	0.1581	0.1655	0.399	0.413	0.416	0.395
0.228	0.431	0.3957	0.4015	0.4130	0.493	0.495	0.502	0.483
0.307	0.526	0.4965	0.5007	0.5118	0.536	0.540	0.548	0.529
0.436	0.654	0.6337	0.6351	0.6441	0.616	0.616	0.625	0.606
0.523	0.727	0.7110	0.7109	0.7181	0.668	0.670	0.679	0.659
0.616	0.793	0.7830	0.7817	0.7871	0.719	0.728	0.736	0.717
0.752	0.878	0.8725	0.8704	0.8734	0.810	0.817	0.823	0.803
0.814	0.913	0.9081	0.9062	0.9083	0.846	0.858	0.864	0.843
0.882	0.947	0.9441	0.9426	0.9438	0.896	0.905	0.909	0.887
$\overline{\Delta y}$		0.0176	0.0162	0.0098	%AAD	1.411	2.440	1.010

Table 4.4 Results of VLE Calculations for R12 (1) / R114 (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=253.15K								
0.138	0.391	0.3622	0.3730	0.3801	0.057	0.051	0.052	0.056
0.344	0.666	0.6566	0.6611	0.6645	0.078	0.073	0.074	0.080
0.493	0.782	0.7830	0.7834	0.7842	0.099	0.089	0.091	0.097
0.683	0.884	0.8909	0.8889	0.8882	0.119	0.111	0.111	0.120
0.821	0.941	0.9463	0.9445	0.9436	0.135	0.126	0.127	0.136
$\overline{\Delta y}$		0.0103	0.0066	0.0043	%AAD	7.855	6.799	1.352
T=283.15 K								
0.142	0.339	0.3197	0.3284	0.3302	0.180	0.165	0.167	0.175
0.265	0.502	0.5090	0.5154	0.5156	0.206	0.197	0.200	0.210
0.426	0.676	0.6840	0.6858	0.6842	0.253	0.242	0.246	0.257
0.525	0.752	0.7646	0.7644	0.7620	0.281	0.270	0.274	0.286
0.577	0.791	0.8010	0.8000	0.7975	0.299	0.286	0.289	0.301
0.665	0.844	0.8549	0.8531	0.8506	0.327	0.312	0.314	0.328
0.776	0.906	0.9119	0.9099	0.9078	0.357	0.345	0.347	0.361
0.789	0.912	0.9180	0.9160	0.9140	0.363	0.349	0.351	0.365
0.859	0.944	0.9482	0.9466	0.9451	0.386	0.371	0.372	0.386
0.882	0.958	0.9574	0.9560	0.9547	0.394	0.378	0.379	0.393
$\overline{\Delta y}$		0.0084	0.0077	0.0062	%AAD	4.545	3.626	1.127
T=313.15K								
0.061	0.152	0.1315	0.1362	0.1357	0.387	0.368	0.371	0.386
0.076	0.178	0.1611	0.1664	0.1657	0.399	0.376	0.379	0.395
0.228	0.431	0.4103	0.4162	0.4133	0.493	0.458	0.465	0.483
0.307	0.526	0.5116	0.5160	0.5122	0.536	0.503	0.510	0.529
0.436	0.654	0.6477	0.6491	0.6444	0.616	0.578	0.587	0.607
0.523	0.727	0.7234	0.7232	0.7183	0.668	0.631	0.640	0.659
0.616	0.793	0.7932	0.7918	0.7872	0.719	0.690	0.697	0.717
0.752	0.878	0.8790	0.8770	0.8735	0.810	0.777	0.784	0.803
0.814	0.913	0.9129	0.9111	0.9083	0.846	0.819	0.824	0.843
0.882	0.947	0.9471	0.9457	0.9439	0.896	0.864	0.869	0.888
$\overline{\Delta y}$		0.0084	0.0066	0.0096	%AAD	5.035	4.067	0.988

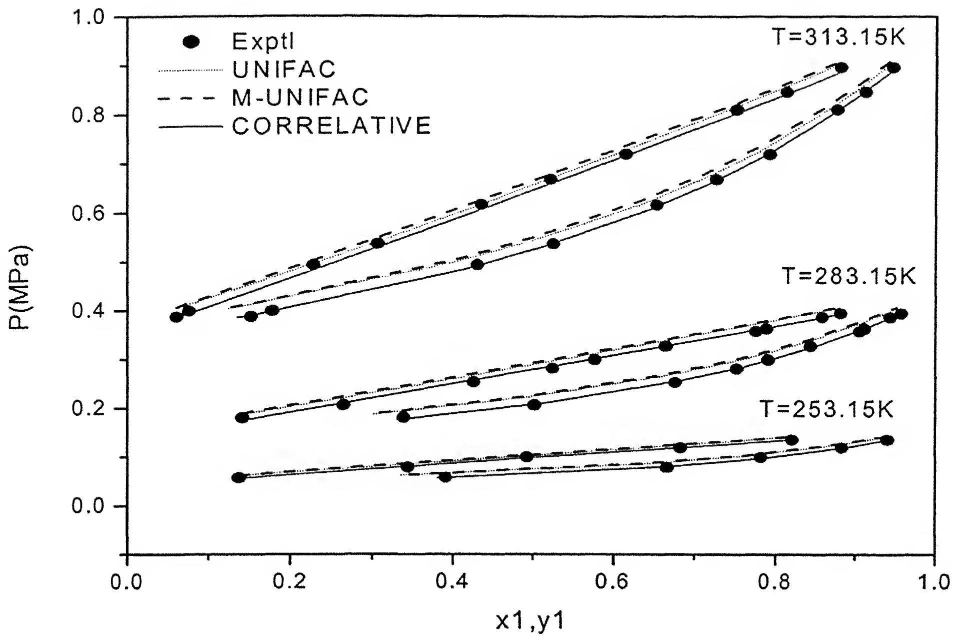

Figure 4.1 P-x-y diagram for R12 (1)/R114 (2) system using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

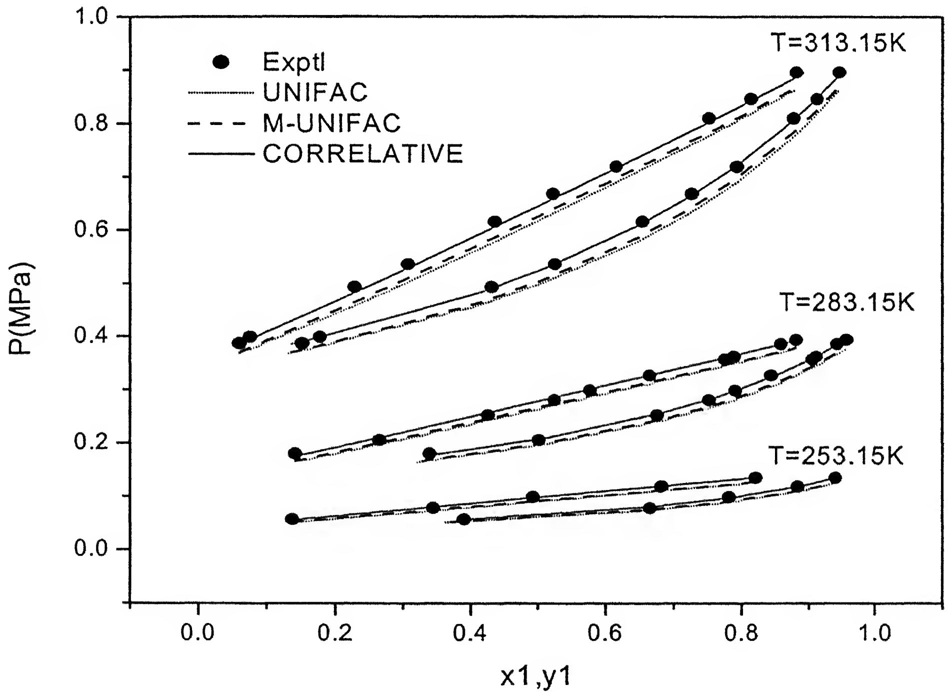

Figure 4.2 P-x-y diagram for R12 (1) / R114 (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

Table 4.5 Results of VLE Calculations for R12 (1) / R114 (2) System using pure components as ref. fluids

x_1	y_1				P(MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=253.15K								
0.138	0.391	0.3664	0.3774	0.3802	0.057	0.051	0.051	0.056
0.344	0.666	0.6605	0.6650	0.6646	0.078	0.072	0.074	0.080
0.493	0.782	0.7860	0.7863	0.7842	0.099	0.089	0.090	0.097
0.683	0.884	0.8925	0.8906	0.8882	0.119	0.110	0.111	0.120
0.821	0.941	0.9471	0.9453	0.9436	0.135	0.126	0.126	0.136
$\overline{\Delta y}$		0.0097	0.0060	0.0042	%AAD	8.768	7.718	1.357
T=283.15K								
0.142	0.339	0.3213	0.3299	0.3302	0.18	0.164	0.167	0.175
0.265	0.502	0.5108	0.5171	0.5157	0.206	0.197	0.201	0.210
0.426	0.676	0.6855	0.6873	0.6840	0.253	0.242	0.246	0.257
0.525	0.752	0.7659	0.7656	0.7620	0.281	0.271	0.275	0.286
0.577	0.791	0.8021	0.8010	0.7974	0.299	0.286	0.290	0.301
0.665	0.844	0.8558	0.8540	0.8505	0.327	0.313	0.315	0.328
0.776	0.906	0.9125	0.9105	0.9078	0.357	0.346	0.348	0.361
0.789	0.912	0.9184	0.9165	0.9139	0.363	0.350	0.352	0.365
0.859	0.944	0.9485	0.9469	0.9451	0.386	0.372	0.373	0.386
0.882	0.958	0.9577	0.9563	0.9547	0.394	0.379	0.380	0.393
$\overline{\Delta y}$		0.0090	0.0083	0.0061	%AAD	4.302	3.383	1.121
T=313.15K								
0.061	0.152	0.1316	0.1362	0.1357	0.387	0.371	0.373	0.386
0.076	0.178	0.1611	0.1664	0.1656	0.399	0.379	0.382	0.395
0.228	0.431	0.4103	0.4162	0.4133	0.493	0.461	0.468	0.483
0.307	0.526	0.5117	0.5160	0.5121	0.536	0.507	0.514	0.529
0.436	0.654	0.6477	0.6491	0.6444	0.616	0.583	0.591	0.606
0.523	0.727	0.7234	0.7232	0.7184	0.668	0.636	0.645	0.659
0.616	0.793	0.7932	0.7918	0.7873	0.719	0.695	0.703	0.717
0.752	0.878	0.8790	0.8770	0.8735	0.810	0.784	0.790	0.803
0.814	0.913	0.9130	0.9111	0.9084	0.846	0.825	0.831	0.843
0.882	0.947	0.9471	0.9458	0.9439	0.896	0.872	0.876	0.888
$\overline{\Delta y}$		0.0084	0.0066	0.0097	%AAD	4.290	3.316	0.988

Table 4.6 Results of VLE Calculations for R22 (1) / R114 (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

x_1	y_1				P			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=253.15K								
0.104	0.522	0.4493	0.4536	0.5132	0.076	0.077	0.078	0.075
0.262	0.731	0.6808	0.6853	0.7292	0.116	0.114	0.117	0.117
0.583	0.883	0.8602	0.8638	0.8814	0.178	0.172	0.177	0.179
0.761	0.932	0.9222	0.9247	0.9333	0.208	0.200	0.206	0.209
0.885	0.965	0.9624	0.9637	0.9674	0.229	0.219	0.227	0.230
$\overline{\Delta y}$		0.0316	0.0284	0.0032	%AAD	2.878	1.211	0.613
T=283.15K								
0.065	0.277	0.2843	0.2864	0.3179	0.181	0.196	0.196	0.190
0.163	0.542	0.5048	0.5078	0.5414	0.264	0.262	0.263	0.262
0.281	0.678	0.6482	0.6515	0.6777	0.336	0.332	0.334	0.336
0.423	0.778	0.7536	0.7568	0.7742	0.423	0.405	0.409	0.414
0.524	0.825	0.8083	0.8113	0.8237	0.469	0.453	0.459	0.464
0.571	0.849	0.8306	0.8334	0.8439	0.498	0.475	0.481	0.487
0.747	0.904	0.9041	0.9061	0.9106	0.562	0.554	0.563	0.570
0.869	0.945	0.9506	0.9518	0.9535	0.619	0.610	0.621	0.628
$\overline{\Delta y}$		0.0174	0.0162	0.0084	%AAD	3.200	2.345	1.764
T=313.15K								
0.160	0.457	0.4424	0.4444	0.4600	0.606	0.597	0.594	0.599
0.227	0.556	0.5365	0.5388	0.5524	0.677	0.682	0.680	0.689
0.269	0.604	0.5836	0.5860	0.5980	0.750	0.734	0.732	0.743
0.409	0.717	0.7019	0.7044	0.7115	0.915	0.895	0.895	0.909
0.427	0.739	0.7143	0.7168	0.7232	0.945	0.915	0.915	0.929
0.634	0.842	0.8322	0.8343	0.8357	1.163	1.136	1.140	1.153
0.638	0.845	0.8342	0.8363	0.8377	1.175	1.141	1.144	1.157
0.766	0.904	0.8949	0.8965	0.8962	1.302	1.276	1.282	1.294
0.817	0.921	0.9180	0.9193	0.9188	1.360	1.331	1.338	1.350
0.857	0.938	0.9360	0.9370	0.9364	1.393	1.374	1.383	1.394
0.957	0.981	0.9807	0.9810	0.9806	1.501	1.486	1.496	1.506
0.967	0.985	0.9852	0.9854	0.9851	1.515	1.497	1.508	1.518
$\overline{\Delta y}$		0.0108	0.0091	0.0050	%AAD	1.895	1.635	0.877
T=338.15K								
0.037	0.135	0.1259	0.1264	0.1293	0.799	0.777	0.767	0.782
0.165	0.403	0.4007	0.4024	0.4057	1.074	1.067	1.055	1.082
0.216	0.480	0.4722	0.4740	0.4763	1.198	1.176	1.163	1.192
0.238	0.503	0.4990	0.5010	0.5028	1.242	1.221	1.209	1.239
0.321	0.595	0.5852	0.5874	0.5873	1.408	1.389	1.377	1.409
0.391	0.637	0.6444	0.6467	0.6453	1.574	1.526	1.514	1.546
0.487	0.722	0.7132	0.7155	0.7127	1.732	1.710	1.698	1.729
0.615	0.808	0.7917	0.7937	0.7900	2.021	1.954	1.943	1.970
$\overline{\Delta y}$		0.0082	0.0069	0.0069	%AAD	1.989	2.893	1.010

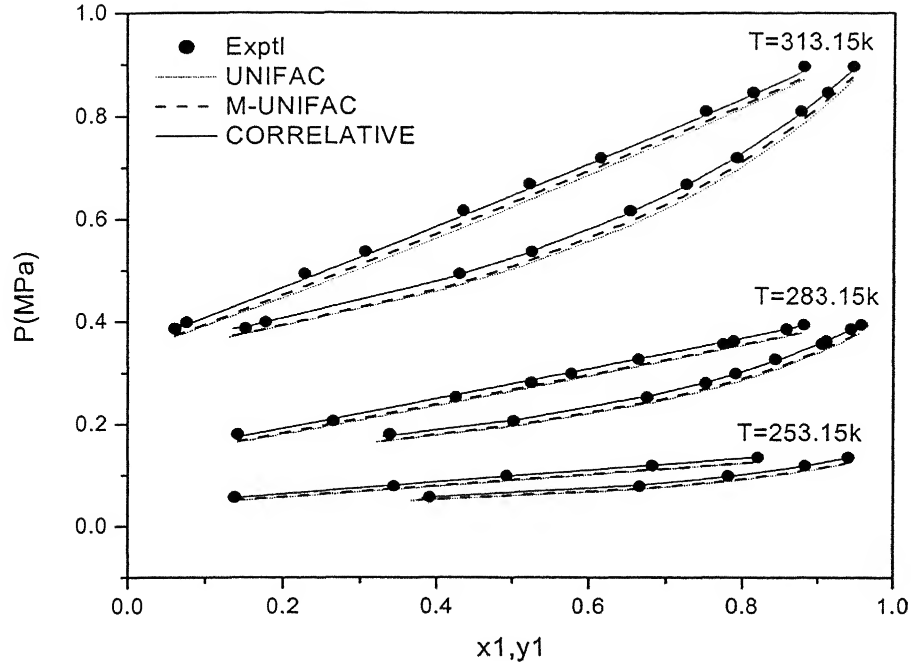

Figure 4.3 P-x-y diagram for R12 (1) / R114 (2) System using Pure components as ref. fluids

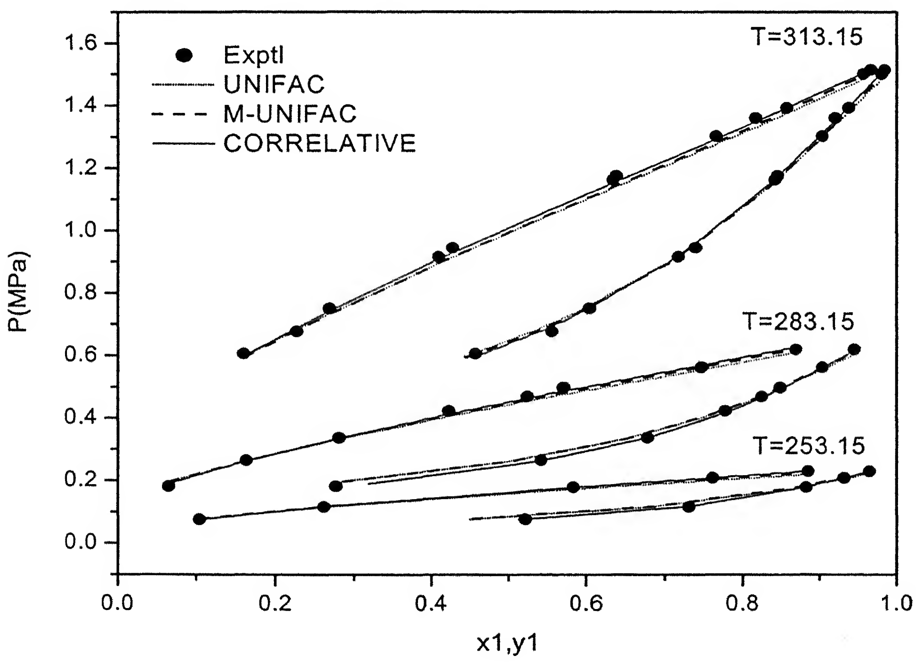

Figure 4.4 P-x-y diagram for R22 (1)/R114 (2) system using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

Table 4.7 Results of VLE Calculations for R22 (1) / R114 (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

x_1	y_1				P			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=253.15K								
0.104	0.522	0.5191	0.5236	0.5205	0.076	0.070	0.071	0.076
0.262	0.731	0.7351	0.7392	0.7313	0.116	0.111	0.113	0.117
0.583	0.883	0.8876	0.8905	0.8809	0.178	0.173	0.177	0.178
0.761	0.932	0.9385	0.9404	0.9331	0.208	0.204	0.210	0.209
0.885	0.965	0.9707	0.9717	0.9675	0.229	0.226	0.234	0.230
$\overline{\Delta y}$		0.0048	0.0065	0.0015	%AAD	3.672	2.438	0.520
T=283.15K								
0.065	0.277	0.3250	0.3272	0.3226	0.181	0.178	0.178	0.191
0.163	0.542	0.5500	0.5530	0.5443	0.264	0.248	0.249	0.263
0.281	0.678	0.6865	0.6897	0.6782	0.336	0.320	0.323	0.337
0.423	0.778	0.7829	0.7858	0.7735	0.423	0.397	0.402	0.413
0.524	0.825	0.8322	0.8348	0.8229	0.469	0.449	0.454	0.463
0.571	0.849	0.8521	0.8546	0.8431	0.498	0.472	0.478	0.486
0.747	0.904	0.9173	0.9190	0.9104	0.562	0.558	0.567	0.569
0.869	0.945	0.9578	0.9588	0.9536	0.619	0.619	0.631	0.627
$\overline{\Delta y}$		0.0132	0.0156	0.0095	%AAD	3.607	3.255	1.809
T=313.15K								
0.160	0.457	0.4710	0.4729	0.4616	0.606	0.568	0.566	0.601
0.227	0.556	0.5638	0.5660	0.5529	0.677	0.657	0.654	0.691
0.269	0.604	0.6095	0.6119	0.5981	0.750	0.710	0.708	0.744
0.409	0.717	0.7227	0.7251	0.7106	0.915	0.876	0.876	0.908
0.427	0.739	0.7344	0.7368	0.7224	0.945	0.896	0.896	0.928
0.634	0.842	0.8454	0.8473	0.8353	1.163	1.128	1.131	1.151
0.638	0.845	0.8473	0.8492	0.8372	1.175	1.132	1.136	1.156
0.766	0.904	0.9037	0.9051	0.8962	1.302	1.276	1.283	1.293
0.817	0.921	0.9251	0.9263	0.9189	1.360	1.335	1.343	1.349
0.857	0.938	0.9416	0.9426	0.9366	1.393	1.382	1.391	1.393
0.957	0.981	0.9825	0.9828	0.9808	1.501	1.504	1.514	1.507
0.967	0.985	0.9866	0.9868	0.9853	1.515	1.516	1.527	1.519
$\overline{\Delta y}$		0.0045	0.0057	0.0052	%AAD	2.966	2.985	0.927
T=338.15K								
0.037	0.135	0.1352	0.1357	0.1307	0.799	0.732	0.722	0.782
0.165	0.403	0.4184	0.4200	0.4067	1.074	1.027	1.016	1.083
0.216	0.480	0.4897	0.4916	0.4768	1.198	1.137	1.125	1.193
0.238	0.503	0.5163	0.5182	0.5031	1.242	1.183	1.172	1.239
0.321	0.595	0.6010	0.6031	0.5871	1.408	1.353	1.342	1.408
0.391	0.637	0.6588	0.6610	0.6449	1.574	1.493	1.481	1.545
0.487	0.722	0.7255	0.7277	0.7123	1.732	1.681	1.669	1.727
0.615	0.808	0.8012	0.8032	0.7899	2.021	1.931	1.921	1.968
$\overline{\Delta y}$		0.0096	0.0109	0.0069	%AAD	4.890	5.743	1.046

Table 4.8 Results of VLE Calculations for R22 (1) / R114 (2) System using pure components as ref. fluids

x_1	y_1				P			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=253.15K								
0.104	0.522	0.5259	0.5275	0.5214	0.076	0.070	0.070	0.076
0.262	0.731	0.7399	0.7429	0.7318	0.116	0.110	0.112	0.117
0.583	0.883	0.8902	0.8934	0.8814	0.178	0.172	0.177	0.179
0.761	0.932	0.9402	0.9425	0.9337	0.208	0.204	0.211	0.209
0.885	0.965	0.9716	0.9729	0.9679	0.229	0.227	0.235	0.231
$\overline{\Delta y}$		0.0069	0.0093	0.0015	%AAD	3.901	3.091	0.689
T=283.15K								
0.065	0.277	0.3244	0.3235	0.3204	0.181	0.178	0.178	0.191
0.163	0.542	0.5495	0.5499	0.5419	0.264	0.247	0.247	0.262
0.281	0.678	0.6862	0.6879	0.6765	0.336	0.320	0.321	0.336
0.423	0.778	0.7831	0.7856	0.7726	0.423	0.397	0.400	0.412
0.524	0.825	0.8327	0.8353	0.8225	0.469	0.448	0.454	0.462
0.571	0.849	0.8527	0.8553	0.8429	0.498	0.472	0.478	0.485
0.747	0.904	0.9180	0.9201	0.9107	0.562	0.559	0.569	0.568
0.869	0.945	0.9583	0.9597	0.9540	0.619	0.621	0.633	0.628
$\overline{\Delta y}$		0.9583	0.9597	0.9540	%AAD	0.621	0.633	0.628
T=313.15K								
0.16	0.457	0.4661	0.4653	0.4578	0.606	0.570	0.566	0.600
0.227	0.556	0.5594	0.5594	0.5496	0.677	0.658	0.654	0.688
0.269	0.604	0.6056	0.6059	0.5952	0.750	0.710	0.707	0.741
0.409	0.717	0.7203	0.7217	0.7090	0.915	0.876	0.874	0.905
0.427	0.739	0.7321	0.7337	0.7209	0.945	0.897	0.895	0.925
0.634	0.842	0.8448	0.8467	0.8352	1.163	1.130	1.132	1.149
0.638	0.845	0.8467	0.8486	0.8371	1.175	1.134	1.137	1.154
$\overline{\Delta y}$		0.0041	0.0046	0.0081	%AAD	4.261	4.489	1.457

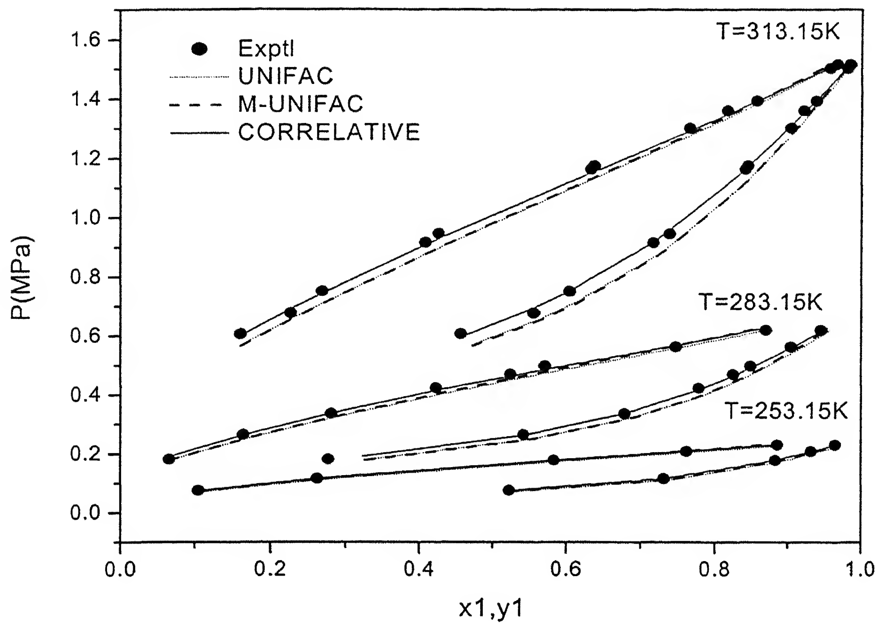

Figure 4.5 P-x-y diagram for R22 (1) / R114 (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

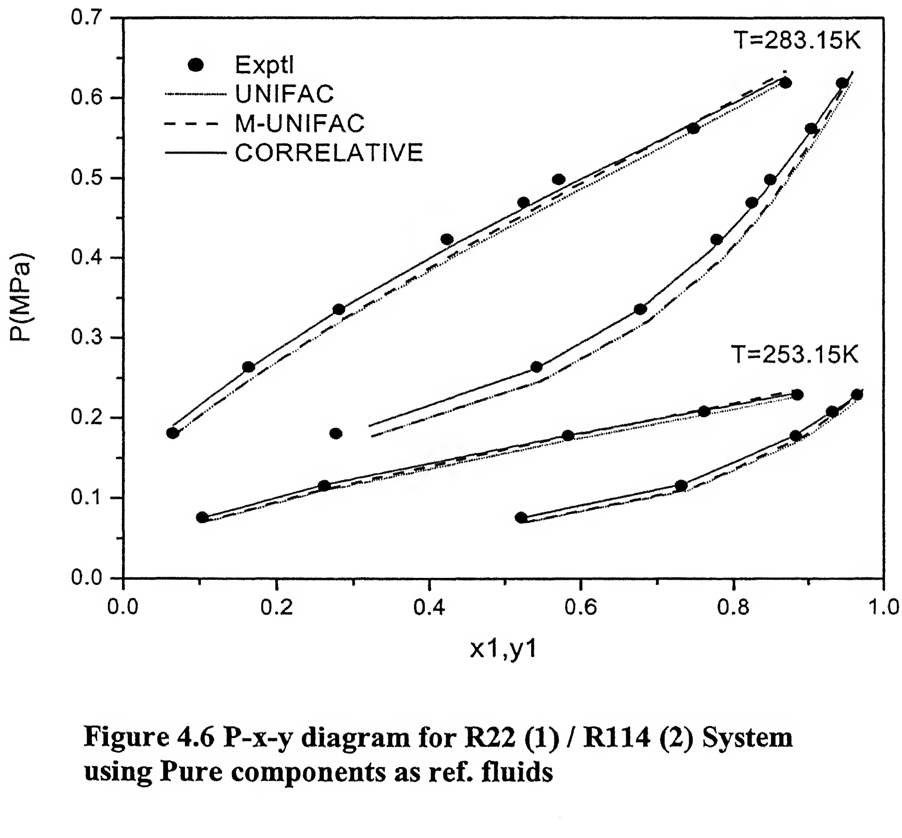

Figure 4.6 P-x-y diagram for R22 (1) / R114 (2) System using Pure components as ref. fluids

Table 4.9 Results of VLE Calculations for R22 (1) / R142b (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=263.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.098	0.098	0.098	0.098
0.068	0.155	0.2061	0.2144	0.1958	0.112	0.109	0.111	0.116
0.101	0.246	0.2851	0.2947	0.2725	0.121	0.117	0.119	0.124
0.265	0.539	0.5588	0.5658	0.5443	0.161	0.158	0.161	0.164
0.394	0.646	0.6937	0.6969	0.6819	0.193	0.190	0.194	0.196
0.448	0.713	0.7380	0.7398	0.7276	0.208	0.203	0.207	0.209
0.523	0.771	0.7910	0.7913	0.7825	0.227	0.222	0.226	0.228
0.543	0.785	0.8038	0.8037	0.7957	0.232	0.227	0.231	0.233
0.573	0.802	0.8220	0.8215	0.8146	0.240	0.234	0.239	0.240
0.631	0.846	0.8542	0.8531	0.8481	0.255	0.249	0.253	0.255
0.666	0.869	0.8721	0.8707	0.8667	0.264	0.258	0.262	0.264
0.712	0.893	0.8939	0.8923	0.8894	0.276	0.270	0.273	0.276
0.790	0.932	0.9272	0.9256	0.9242	0.298	0.290	0.293	0.296
0.934	0.983	0.9794	0.9786	0.9785	0.336	0.327	0.330	0.333
1.000	1.000	1.0000	1.0000	1.0000	0.355	0.355	0.355	0.355
$\overline{\Delta y}$		0.0202	0.0224	0.0137	%AAD	2.404	0.872	0.882
T=273.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.146	0.146	0.146	0.146
0.127	0.291	0.3245	0.3334	0.3119	0.184	0.180	0.183	0.189
0.203	0.438	0.4554	0.4636	0.4417	0.211	0.206	0.209	0.214
0.288	0.574	0.5690	0.5750	0.5559	0.239	0.234	0.239	0.243
0.356	0.645	0.6422	0.6463	0.6303	0.263	0.258	0.263	0.266
0.484	0.756	0.7511	0.7520	0.7420	0.308	0.302	0.307	0.310
0.522	0.780	0.7780	0.7782	0.7696	0.320	0.315	0.320	0.323
0.579	0.817	0.8146	0.8140	0.8075	0.341	0.334	0.339	0.343
0.627	0.836	0.8425	0.8414	0.8364	0.358	0.351	0.356	0.360
0.714	0.891	0.8875	0.8859	0.8832	0.390	0.382	0.386	0.390
0.772	0.915	0.9141	0.9124	0.9109	0.411	0.402	0.406	0.411
0.794	0.924	0.9237	0.9220	0.9208	0.417	0.410	0.414	0.419
0.815	0.936	0.9325	0.9308	0.9299	0.427	0.418	0.421	0.426
0.838	0.945	0.9418	0.9403	0.9396	0.436	0.426	0.429	0.435
0.857	0.951	0.9493	0.9479	0.9473	0.442	0.433	0.436	0.442
1.000	1.000	1.0000	1.0000	1.0000	0.498	0.498	0.498	0.498
$\overline{\Delta y}$		0.0063	0.0077	0.0087	%AAD	2.057	0.743	0.763
T=283.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.210	0.210	0.210	0.210
0.142	0.312	0.3377	0.3460	0.3260	0.271	0.261	0.265	0.273
0.304	0.543	0.5705	0.5757	0.5586	0.345	0.334	0.340	0.346
0.463	0.707	0.7213	0.7226	0.7121	0.418	0.407	0.413	0.418
0.527	0.750	0.7689	0.7690	0.7610	0.447	0.437	0.443	0.448

Table 4.9 (Continued)

x_1	y_1				P (MPa)			
Exptl	Exptl	Calculated			Exptl	Calculated		
		UNIFAC	M-UNIFAC	CORRELATIVE		UNIFAC	M-UNIFAC	CORRELATIVE
T=283.15K								
0.571	0.783	0.7983	0.7978	0.7914	0.471	0.458	0.463	0.469
0.597	0.800	0.8147	0.8138	0.8083	0.481	0.470	0.475	0.481
0.665	0.842	0.8541	0.8527	0.8490	0.514	0.502	0.507	0.513
0.693	0.856	0.8691	0.8675	0.8646	0.524	0.515	0.520	0.527
0.725	0.872	0.8855	0.8838	0.8815	0.541	0.531	0.535	0.542
0.748	0.886	0.8967	0.8951	0.8932	0.554	0.542	0.546	0.553
0.780	0.900	0.9118	0.9102	0.9088	0.565	0.557	0.561	0.568
0.792	0.911	0.9173	0.9157	0.9145	0.575	0.563	0.567	0.574
0.863	0.946	0.9480	0.9466	0.9462	0.607	0.597	0.601	0.609
0.889	0.954	0.9585	0.9574	0.9571	0.627	0.610	0.613	0.622
1.000	1.000	1.0000	1.0000	1.0000	0.679	0.679	0.679	0.679
$\overline{\Delta y}$		0.0136	0.0137	0.0079	%AAD	2.336	1.332	0.332
T=293.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.293	0.293	0.293	0.293
0.118	0.259	0.2788	0.2862	0.2690	0.360	0.345	0.348	0.360
0.173	0.351	0.3756	0.3830	0.3644	0.393	0.377	0.382	0.392
0.244	0.455	0.4798	0.4860	0.4682	0.432	0.419	0.425	0.433
0.311	0.542	0.5618	0.5664	0.5507	0.474	0.459	0.465	0.473
0.436	0.670	0.6845	0.6863	0.6754	0.545	0.534	0.541	0.548
0.518	0.733	0.7495	0.7498	0.7420	0.595	0.584	0.591	0.598
0.570	0.783	0.7860	0.7855	0.7794	0.629	0.616	0.622	0.630
0.609	0.805	0.8113	0.8103	0.8054	0.657	0.640	0.646	0.654
0.636	0.821	0.8278	0.8266	0.8225	0.672	0.657	0.663	0.670
0.657	0.831	0.8403	0.8389	0.8353	0.688	0.670	0.676	0.684
0.696	0.854	0.8623	0.8608	0.8580	0.710	0.694	0.700	0.708
0.737	0.880	0.8842	0.8825	0.8806	0.735	0.720	0.725	0.734
0.782	0.902	0.9067	0.9051	0.9038	0.764	0.749	0.753	0.763
0.811	0.921	0.9206	0.9190	0.9181	0.785	0.768	0.772	0.781
0.827	0.925	0.9280	0.9265	0.9258	0.795	0.778	0.782	0.792
0.861	0.941	0.9433	0.9419	0.9416	0.814	0.800	0.803	0.814
0.873	0.946	0.9486	0.9473	0.9470	0.824	0.808	0.811	0.822
0.897	0.959	0.9588	0.9577	0.9576	0.846	0.824	0.826	0.837
0.919	0.970	0.9680	0.9671	0.9671	0.857	0.838	0.840	0.852
1.000	1.000	1.0000	1.0000	1.0000	0.910	0.910	0.910	0.910
$\overline{\Delta y}$		0.0091	0.0101	0.0045	%AAD	2.463	1.662	0.342
T=313.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.526	0.526	0.526	0.526
0.072	0.155	0.1654	0.1704	0.1596	0.589	0.571	0.573	0.593
0.079	0.172	0.1796	0.1849	0.1734	0.596	0.577	0.579	0.599
0.095	0.200	0.2110	0.2167	0.2041	0.618	0.592	0.595	0.613
0.211	0.392	0.4022	0.4080	0.3928	0.720	0.701	0.707	0.720

Table 4.9 (Continued)

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=313.15K								
0.269	0.472	0.4790	0.4840	0.4696	0.769	0.801	0.764	0.774
0.321	0.525	0.5401	0.5439	0.5309	0.799	0.855	0.814	0.824
0.406	0.610	0.6269	0.6290	0.6187	0.906	0.940	0.897	0.905
0.469	0.677	0.6830	0.6839	0.6757	0.965	1.002	0.959	0.967
0.563	0.749	0.7564	0.7560	0.7505	1.059	1.094	1.053	1.060
0.574	0.761	0.7643	0.7637	0.7586	1.063	1.105	1.063	1.071
0.631	0.803	0.8032	0.8022	0.7985	1.113	1.160	1.121	1.129
0.653	0.815	0.8175	0.8163	0.8131	1.138	1.181	1.143	1.152
0.736	0.869	0.8677	0.8661	0.8645	1.230	1.262	1.228	1.238
0.800	0.906	0.9031	0.9016	0.9008	1.287	1.325	1.295	1.305
0.804	0.908	0.9053	0.9037	0.9030	1.304	1.329	1.299	1.310
0.837	0.925	0.9225	0.9210	0.9207	1.347	1.362	1.334	1.345
1.000	1.000	1.0000	1.0000	1.0000	1.534	1.534	1.534	1.534
$\overline{\Delta y}$		0.0067	0.0091	0.0037	%AAD	2.919	1.199	0.750
T=338.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.995	0.995	0.995	0.995
0.104	0.194	0.2012	0.2056	0.1961	1.133	1.118	1.121	1.138
0.153	0.276	0.2801	0.2849	0.2739	1.219	1.192	1.198	1.211
0.247	0.398	0.4105	0.4146	0.4037	1.334	1.338	1.348	1.353
0.415	0.591	0.5942	0.5957	0.5882	1.626	1.607	1.620	1.616
0.497	0.665	0.6677	0.6680	0.6626	1.766	1.744	1.756	1.750
0.594	0.744	0.7448	0.7441	0.7409	1.926	1.909	1.920	1.913
0.633	0.777	0.7735	0.7724	0.7700	1.999	1.978	1.988	1.980
0.664	0.796	0.7953	0.7941	0.7922	2.052	2.033	2.042	2.034
0.732	0.845	0.8411	0.8397	0.8387	2.180	2.156	2.163	2.155
0.829	0.895	0.9018	0.9005	0.9004	2.328	2.338	2.341	2.333
0.880	0.925	0.9320	-	-	2.437	2.437	-	-
1.000	1.000	1.0000	1.0000	1.0000	2.704	2.704	2.704	2.704
$\overline{\Delta y}$		0.0048	0.0062	0.0041	%AAD	0.970	0.745	0.801

Table 4.10 Results of VLE Calculations for R22 (1) / R142b (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=263.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.098	0.098	0.098	0.098
0.068	0.155	0.2010	0.2091	0.1957	0.112	0.116	0.117	0.116
0.101	0.246	0.2788	0.2882	0.2724	0.121	0.124	0.126	0.124
0.265	0.539	0.5510	0.5580	0.5443	0.161	0.165	0.169	0.164
0.394	0.646	0.6869	0.6902	0.6819	0.193	0.198	0.202	0.196
0.448	0.713	0.7319	0.7336	0.7275	0.208	0.212	0.216	0.209
0.523	0.771	0.7858	0.7860	0.7824	0.227	0.231	0.235	0.228
0.543	0.785	0.7987	0.7987	0.7956	0.232	0.236	0.240	0.233
0.573	0.802	0.8173	0.8167	0.8145	0.240	0.244	0.248	0.240
0.631	0.846	0.8502	0.8491	0.8481	0.255	0.259	0.263	0.255
0.666	0.869	0.8685	0.8670	0.8666	0.264	0.268	0.272	0.264
0.712	0.893	0.8908	0.8892	0.8894	0.276	0.280	0.284	0.276
0.790	0.932	0.9251	0.9234	0.9242	0.298	0.300	0.304	0.296
0.934	0.983	0.9787	0.9779	0.9785	0.336	0.338	0.341	0.333
1.000	1.000	1.0000	1.0000	1.0000	0.355	0.355	0.355	0.355
$\overline{\Delta y}$		0.0163	0.0189	0.0137	%AAD	1.798	3.496	0.880
T=273.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.146	0.146	0.146	0.146
0.127	0.291	0.3182	0.3271	0.3118	0.184	0.189	0.192	0.189
0.203	0.438	0.4484	0.4565	0.4416	0.211	0.215	0.219	0.214
0.288	0.574	0.5619	0.5680	0.5558	0.239	0.244	0.249	0.243
0.356	0.645	0.6357	0.6397	0.6303	0.263	0.268	0.273	0.266
0.484	0.756	0.7456	0.7466	0.7419	0.308	0.313	0.318	0.310
0.522	0.780	0.7729	0.7731	0.7696	0.320	0.326	0.331	0.323
0.579	0.817	0.8102	0.8095	0.8075	0.341	0.346	0.351	0.343
0.627	0.836	0.8386	0.8375	0.8364	0.358	0.363	0.368	0.360
0.714	0.891	0.8846	0.8829	0.8832	0.390	0.394	0.399	0.390
0.772	0.915	0.9118	0.9101	0.9108	0.411	0.415	0.419	0.411
0.794	0.924	0.9216	0.9199	0.9207	0.417	0.423	0.427	0.419
0.815	0.936	0.9306	0.9289	0.9299	0.427	0.431	0.434	0.426
0.838	0.945	0.9402	0.9386	0.9396	0.436	0.439	0.443	0.435
0.857	0.951	0.9479	0.9464	0.9474	0.442	0.446	0.449	0.442
1.000	1.000	1.0000	1.0000	1.0000	0.498	0.498	0.498	0.498
$\overline{\Delta y}$		0.0080	0.0090	0.0087	%AAD	1.460	2.827	0.758
T=283.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.210	0.210	0.210	0.210
0.142	0.312	0.3319	0.3400	0.3259	0.271	0.272	0.276	0.273
0.304	0.543	0.5641	0.5692	0.5585	0.345	0.346	0.352	0.346
0.463	0.707	0.7160	0.7173	0.7120	0.418	0.420	0.427	0.418
0.527	0.750	0.7641	0.7642	0.7609	0.447	0.450	0.457	0.448

Table 4.10 (Continued)

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=283.15K								
0.571	0.783	0.7940	0.7935	0.7914	0.471	0.471	0.477	0.469
0.597	0.800	0.8106	0.8098	0.8082	0.481	0.484	0.489	0.481
0.665	0.842	0.8508	0.8493	0.8490	0.514	0.516	0.521	0.513
0.693	0.856	0.8661	0.8645	0.8645	0.524	0.530	0.535	0.527
0.725	0.872	0.8828	0.8811	0.8815	0.541	0.545	0.550	0.542
0.748	0.886	0.8943	0.8926	0.8931	0.554	0.556	0.561	0.553
0.780	0.900	0.9097	0.9080	0.9088	0.565	0.572	0.576	0.568
0.792	0.911	0.9153	0.9136	0.9144	0.575	0.578	0.582	0.574
0.863	0.946	0.9467	0.9453	0.9462	0.607	0.613	0.616	0.609
0.889	0.954	0.9575	0.9563	0.9571	0.627	0.626	0.629	0.622
1.000	1.000	1.0000	1.0000	1.0000	0.679	0.679	0.679	0.679
$\overline{\Delta y}$		0.0101	0.0103	0.0078	%AAD	0.593	1.601	0.329
T=293.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.293	0.293	0.293	0.293
0.118	0.259	0.2740	0.2813	0.2689	0.360	0.358	0.361	0.360
0.173	0.351	0.3701	0.3774	0.3643	0.393	0.391	0.395	0.392
0.244	0.455	0.4739	0.4801	0.4681	0.432	0.433	0.439	0.433
0.311	0.542	0.5559	0.5606	0.5507	0.474	0.473	0.480	0.473
0.436	0.670	0.6794	0.6811	0.6753	0.545	0.549	0.556	0.548
0.518	0.733	0.7451	0.7453	0.7419	0.595	0.599	0.606	0.598
0.570	0.783	0.7820	0.7815	0.7794	0.629	0.632	0.638	0.629
0.609	0.805	0.8076	0.8067	0.8054	0.657	0.656	0.662	0.654
0.636	0.821	0.8244	0.8232	0.8224	0.672	0.673	0.679	0.670
0.657	0.831	0.8371	0.8357	0.8352	0.688	0.686	0.692	0.684
0.696	0.854	0.8594	0.8579	0.8579	0.710	0.711	0.717	0.708
0.737	0.880	0.8817	0.8800	0.8805	0.735	0.737	0.742	0.734
0.782	0.902	0.9047	0.9030	0.9038	0.764	0.766	0.771	0.763
0.811	0.921	0.9188	0.9172	0.9181	0.785	0.785	0.789	0.781
0.827	0.925	0.9264	0.9248	0.9258	0.795	0.795	0.799	0.792
0.861	0.941	0.9420	0.9406	0.9416	0.814	0.818	0.821	0.814
0.873	0.946	0.9474	0.9461	0.9470	0.824	0.826	0.829	0.822
0.897	0.959	0.9579	0.9568	0.9576	0.846	0.841	0.844	0.837
0.919	0.97	0.9673	0.9663	0.9671	0.857	0.856	0.859	0.852
1.000	1.000	1.0000	1.0000	1.0000	0.91	0.910	0.910	0.910
$\overline{\Delta y}$		0.0064	0.0074	0.0045	%AAD	0.319	0.904	0.343
T=313.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.526	0.526	0.526	0.526
0.072	0.155	0.1627	0.1677	0.1595	0.589	0.588	0.590	0.592
0.079	0.172	0.1768	0.1819	0.1734	0.596	0.594	0.596	0.599
0.095	0.200	0.2078	0.2134	0.2040	0.618	0.609	0.612	0.613
0.211	0.392	0.3976	0.4033	0.3926	0.720	0.718	0.725	0.720

Table 4.10 (Continued)

x_1	y_1				P (MPa)			
Exptl	Exptl	Calculated			Exptl	Calculated		
		UNIFAC	M-UNIFAC	CORRELATIVE		UNIFAC	M-UNIFAC	CORRELATIVE
T=313.15K								
0.269	0.472	0.4743	0.4791	0.4695	0.769	0.774	0.782	0.774
0.321	0.525	0.5353	0.5392	0.5308	0.799	0.824	0.832	0.824
0.406	0.610	0.6224	0.6246	0.6186	0.906	0.907	0.916	0.905
0.469	0.677	0.6788	0.6798	0.6756	0.965	0.969	0.978	0.967
0.563	0.749	0.7528	0.7524	0.7505	1.059	1.063	1.072	1.060
0.574	0.761	0.7608	0.7603	0.7585	1.063	1.075	1.083	1.071
0.631	0.803	0.8003	0.7991	0.7984	1.113	1.133	1.140	1.129
0.653	0.815	0.8146	0.8134	0.8130	1.138	1.156	1.163	1.151
0.736	0.869	0.8655	0.8639	0.8645	1.230	1.243	1.248	1.238
0.800	0.906	0.9015	0.8999	0.9008	1.287	1.311	1.315	1.305
0.804	0.908	0.9036	0.9020	0.9030	1.304	1.315	1.319	1.310
0.837	0.925	0.9211	0.9197	0.9206	1.347	1.351	1.354	1.345
1.000	1.000	1.0000	1.0000	1.0000	1.534	1.534	1.534	1.534
$\overline{\Delta y}$		0.0048	0.0074	0.0037	%AAD	0.947	1.449	0.745
T=338.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.995	0.995	0.995	0.995
0.104	0.194	0.1988	0.2032	0.1960	1.133	1.138	1.142	1.138
0.153	0.276	0.2772	0.2819	0.2738	1.219	1.213	1.219	1.211
0.247	0.398	0.4070	0.4111	0.4035	1.334	1.359	1.368	1.353
0.415	0.591	0.5907	0.5923	0.5881	1.626	1.628	1.640	1.616
0.497	0.665	0.6645	0.6649	0.6625	1.766	1.764	1.776	1.750
0.594	0.744	0.7422	0.7414	0.7408	1.926	1.930	1.941	1.912
0.633	0.777	0.7710	0.7700	0.7699	1.999	1.998	2.008	1.979
0.664	0.796	0.7931	0.7919	0.7922	2.052	2.053	2.062	2.034
0.732	0.845	0.8393	0.8378	0.8387	2.180	2.176	2.183	2.155
0.829	0.895	-	-	0.9004	2.328	-	-	2.333
0.880	0.925	-	-	-	2.437	-	-	-
1.000	1.000	1.0000	1.0000	1.0000	2.704	2.704	2.704	2.704
$\overline{\Delta y}$		0.0036	0.0056	0.0041	%AAD	0.390	0.740	0.806

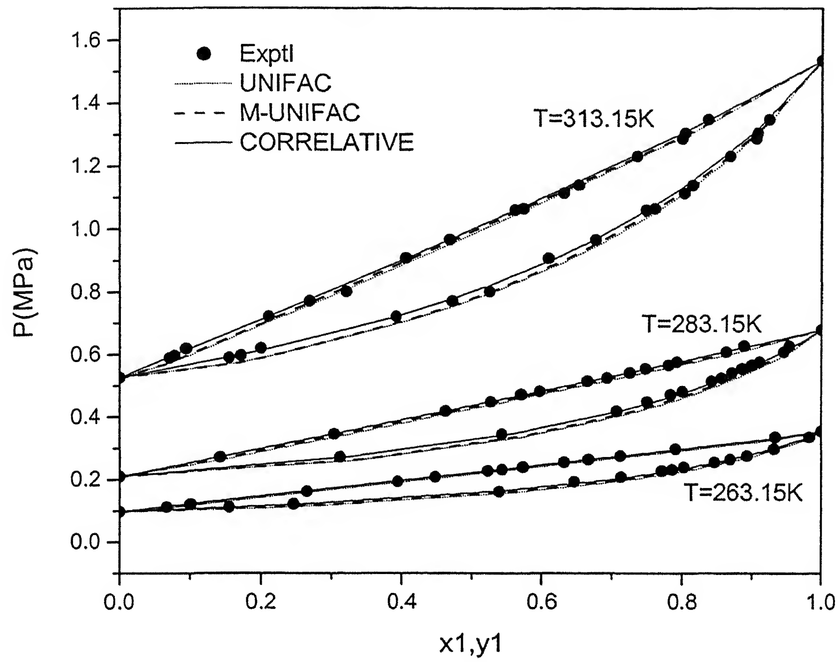

Figure 4.7 P-x-y diagram for R22 (1)/R142b (2) system using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

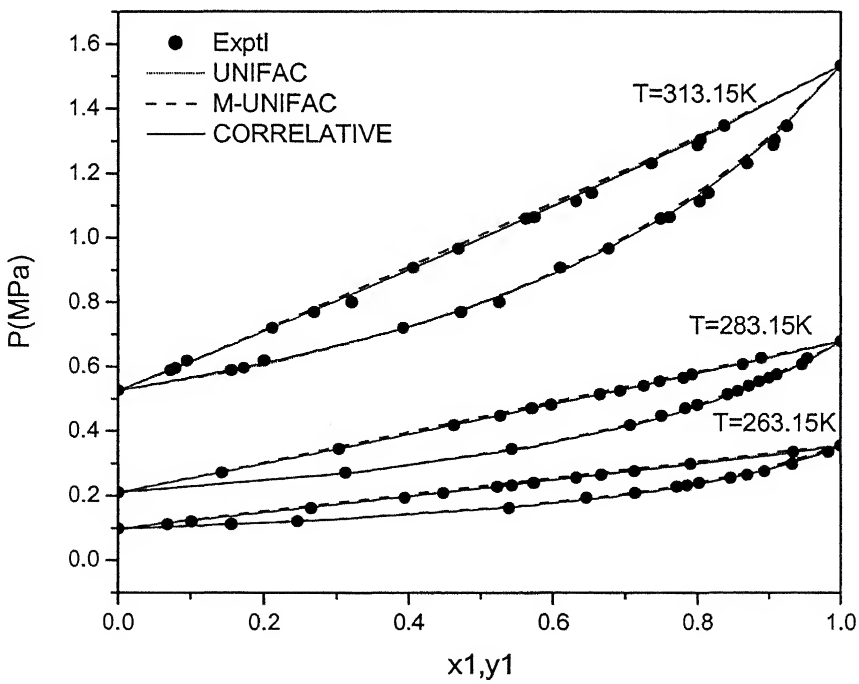

Figure 4.8 P-x-y diagram for R22 (1) / R142b (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

Table 4.11 Results of VLE Calculations for R22 (1) / R142b (2) System using Pure components as ref. fluids

x_1	y_1				P(MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=263.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.098	0.098	0.098	0.098
0.068	0.155	0.2028	0.2150	0.1962	0.112	0.115	0.120	0.116
0.101	0.246	0.2810	0.2958	0.2730	0.121	0.123	0.130	0.124
0.265	0.539	0.5534	0.5696	0.5448	0.161	0.165	0.177	0.164
0.394	0.646	0.6888	0.7017	0.6820	0.193	0.198	0.213	0.196
0.448	0.713	0.7334	0.7447	0.7276	0.208	0.212	0.229	0.209
0.523	0.771	0.7870	0.7963	0.7824	0.227	0.231	0.250	0.228
0.543	0.785	0.7999	0.8087	0.7957	0.232	0.236	0.256	0.233
0.573	0.802	0.8183	0.8263	0.8145	0.240	0.244	0.265	0.240
0.631	0.846	0.8511	0.8576	0.8481	0.255	0.259	0.282	0.255
0.666	0.869	0.8692	0.8749	0.8666	0.264	0.268	0.292	0.264
0.712	0.893	0.8915	0.8961	0.8894	0.276	0.280	0.305	0.276
0.790	0.932	0.9255	0.9286	0.9242	0.298	0.300	0.328	0.296
0.934	0.983	0.9788	0.9796	0.9785	0.336	0.338	0.371	0.333
1.000	1.000	1.0000	1.0000	1.0000	0.355	0.355	0.355	0.355
$\overline{\Delta y}$		0.0173	0.0253	0.0138	%AAD	1.684	9.804	0.890
T=273.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.146	0.146	0.146	0.146
0.127	0.291	0.3197	0.3343	0.3121	0.184	0.188	0.198	0.189
0.203	0.438	0.4499	0.4658	0.4419	0.211	0.215	0.227	0.214
0.288	0.574	0.5633	0.5781	0.5560	0.239	0.244	0.260	0.243
0.356	0.645	0.6368	0.6502	0.6303	0.263	0.268	0.287	0.266
0.484	0.756	0.7465	0.7564	0.7419	0.308	0.313	0.337	0.310
0.522	0.780	0.7736	0.7826	0.7695	0.320	0.326	0.352	0.323
0.579	0.817	0.8108	0.8183	0.8074	0.341	0.346	0.374	0.343
0.627	0.836	0.8391	0.8455	0.8363	0.358	0.363	0.394	0.360
0.714	0.891	0.8849	0.8894	0.8831	0.390	0.395	0.428	0.390
0.772	0.915	0.9121	0.9155	0.9108	0.411	0.416	0.452	0.411
0.794	0.924	0.9218	0.9248	0.9207	0.417	0.424	0.461	0.419
0.815	0.936	0.9308	0.9334	0.9298	0.427	0.431	0.469	0.426
0.838	0.945	0.9404	0.9426	0.9395	0.436	0.440	0.478	0.435
0.857	0.951	0.9480	0.9499	0.9473	0.442	0.447	0.486	0.441
1.000	1.000	1.0000	1.0000	1.0000	0.498	0.498	0.498	0.498
$\overline{\Delta y}$		0.0078	0.0074	0.0088	%AAD	1.511	9.449	0.764
T=283.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.210	0.210	0.210	0.210
0.142	0.312	0.3326	0.3464	0.3260	0.271	0.272	0.285	0.273
0.304	0.543	0.5647	0.5784	0.5584	0.345	0.347	0.369	0.346
0.463	0.707	0.7163	0.7263	0.7120	0.418	0.421	0.452	0.418
0.527	0.750	0.7644	0.7729	0.7608	0.447	0.451	0.485	0.448
0.571	0.783	0.7943	0.8016	0.7913	0.471	0.472	0.508	0.469

Table 4.11 (Continued)

x_1	y_1				P(MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=283.15K								
0.597	0.800	0.8109	0.8177	0.8081	0.481	0.484	0.522	0.481
0.665	0.842	0.8510	0.8563	0.8489	0.514	0.517	0.558	0.513
0.693	0.856	0.8663	0.8710	0.8644	0.524	0.531	0.573	0.526
0.725	0.872	0.8829	0.8870	0.8814	0.541	0.546	0.591	0.542
0.748	0.886	0.8944	0.8981	0.8931	0.554	0.557	0.603	0.553
0.780	0.900	0.9098	0.9129	0.9087	0.565	0.573	0.621	0.568
0.792	0.911	0.9154	0.9183	0.9144	0.575	0.579	0.627	0.574
0.863	0.946	0.9468	0.9485	0.9462	0.607	0.614	0.666	0.609
0.889	0.954	0.9576	0.9589	0.9571	0.627	0.627	0.681	0.621
1.000	1.000	1.0000	1.0000	1.0000	0.679	0.679	0.679	0.679
$\overline{\Delta y}$		0.0104	0.0166	0.0078	%AAD	0.732	8.466	0.331
T=293.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.293	0.293	0.293	0.293
0.118	0.259	0.2741	0.2859	0.2688	0.360	0.359	0.374	0.360
0.173	0.351	0.3700	0.3834	0.3641	0.393	0.392	0.411	0.392
0.244	0.455	0.4738	0.4873	0.4680	0.432	0.434	0.458	0.433
0.311	0.542	0.5559	0.5684	0.5505	0.474	0.474	0.503	0.473
0.436	0.670	0.6793	0.6894	0.6752	0.545	0.550	0.587	0.548
0.518	0.733	0.7450	0.7532	0.7418	0.595	0.601	0.643	0.597
0.570	0.783	0.7819	0.7889	0.7793	0.629	0.633	0.679	0.629
0.609	0.805	0.8075	0.8137	0.8052	0.657	0.658	0.706	0.653
0.636	0.821	0.8244	0.8299	0.8224	0.672	0.675	0.725	0.670
0.657	0.831	0.8370	0.8421	0.8352	0.688	0.688	0.740	0.683
0.696	0.854	0.8594	0.8638	0.8579	0.710	0.713	0.768	0.708
0.737	0.880	0.8816	0.8853	0.8805	0.735	0.739	0.797	0.734
0.782	0.902	0.9047	0.9075	0.9038	0.764	0.768	0.829	0.763
0.811	0.921	0.9188	0.9212	0.9181	0.785	0.787	0.850	0.781
0.827	0.925	0.9264	0.9286	0.9258	0.795	0.797	0.862	0.792
0.861	0.941	0.9420	0.9437	0.9416	0.814	0.820	0.887	0.814
0.873	0.946	0.9474	0.9489	0.9470	0.824	0.828	0.895	0.822
0.897	0.959	0.9579	0.9591	0.9576	0.846	0.844	0.913	0.837
0.919	0.970	0.9673	0.9682	0.9671	0.857	0.858	0.929	0.852
1.000	1.000	1.0000	1.0000	1.0000	0.910	0.910	0.910	0.910
$\overline{\Delta y}$		0.0063	0.0118	0.0044	%AAD	0.412	7.531	0.354
T=313.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.526	0.526	0.526	0.526
0.072	0.155	0.1622	0.1693	0.1594	0.589	0.591	0.611	0.593
0.079	0.172	0.1762	0.1838	0.1732	0.596	0.598	0.618	0.599
0.095	0.200	0.2071	0.2156	0.2039	0.618	0.613	0.634	0.613
0.211	0.392	0.3966	0.4077	0.3924	0.720	0.722	0.756	0.720
0.269	0.472	0.4733	0.4843	0.4692	0.769	0.777	0.817	0.774
0.321	0.525	0.5343	0.5448	0.5306	0.799	0.827	0.873	0.823

Table 4.11 (Continued)

x_1	y_1				P(MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=313.15K								
0.406	0.610	0.6214	0.6306	0.6185	0.906	0.910	0.965	0.905
0.469	0.677	0.6780	0.6859	0.6755	0.965	0.972	1.034	0.966
0.563	0.749	0.7522	0.7583	0.7505	1.059	1.067	1.138	1.060
0.574	0.761	0.7602	0.7661	0.7585	1.063	1.078	1.151	1.071
0.631	0.803	0.7998	0.8045	0.7985	1.113	1.137	1.216	1.129
0.653	0.815	0.8142	0.8186	0.8131	1.138	1.160	1.241	1.151
0.736	0.869	0.8652	-	0.8645	1.230	1.247	-	1.238
0.800	0.906	-	-	0.9009	1.287	-	-	1.306
0.804	0.908	-	-	0.9030	1.304	-	-	1.310
0.837	0.925	-	-	-	1.347	-	-	-
1.000	1.000	1.0000	1.0000	1.0000	1.534	1.534	1.534	1.534
$\overline{\Delta y}$		0.0045	0.0115	0.0035	%AAD	1.159	6.506	0.782

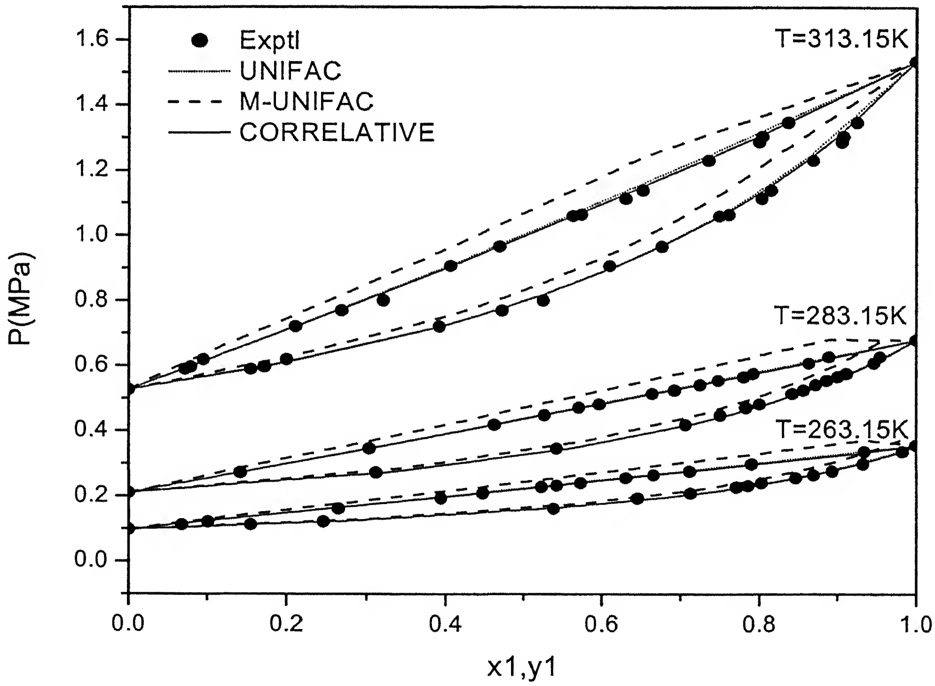

Figure 4.9 P-x-y diagram for R22 (1) / R142b (2) System using pure components as ref. fluids

Table 4.12 Results of VLE Calculations for R32 (1) / R125 (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=268.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.5713	0.5713	0.5713	0.5713
0.1966	0.2282	0.1768	0.2132	0.2278	0.6068	0.5967	0.6282	0.6329
0.3494	0.3979	0.3143	0.3490	0.3862	0.6343	0.5825	0.6333	0.6530
0.4929	0.5363	0.4464	0.4653	0.5251	0.6588	0.5670	0.6286	0.6684
0.6265	0.6578	0.5751	0.5733	0.6492	0.6767	0.5506	0.6159	0.6796
0.7323	0.7542	0.6833	0.6658	0.7462	0.6866	0.5361	0.5993	0.6863
1.0000	1.0000	1.0000	1.0000	1.0000	0.6938	0.6938	0.6938	0.6938
$\overline{\Delta y}$		0.0757	0.06159	0.00799	%AAD	12.865	5.994	1.839
T=273.15K								
0.0550	0.0770	0.0513	0.0669	0.06725	0.6910	0.7110	0.7162	0.7132
0.2440	0.2870	0.2253	0.2624	0.27953	0.7540	0.6974	0.7417	0.7485
0.4010	0.4580	0.3698	0.3991	0.43870	0.7890	0.6831	0.7473	0.7727
0.5140	0.5600	0.4758	0.4912	0.54682	0.8020	0.6709	0.7433	0.7872
0.6460	0.6820	0.6043	0.5998	0.66900	0.0813	0.6547	0.7300	0.8008
0.7460	0.7700	0.7065	0.6887	0.76057	0.8160	0.6407	0.7128	0.8089
0.8150	0.8190	0.7808	0.7570	0.82405	0.8180	0.6302	0.6965	0.8132
0.8950	0.8920	0.8714	0.8482	0.89877	0.8160	0.6170	0.6722	0.8169
$\overline{\Delta y}$		0.0575	0.0540	0.0105	%AAD	16.059	9.152	1.366
T=278.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.7854	0.7854	0.7854	0.7854
0.1883	0.2185	0.1787	0.2128	0.2203	0.8331	0.8197	0.8592	0.8590
0.3422	0.3827	0.3227	0.3557	0.3816	0.8722	0.8086	0.8753	0.8901
0.4984	0.5361	0.4699	0.4868	0.5335	0.9052	0.7940	0.8765	0.9162
0.6299	0.6603	0.5971	0.5954	0.6558	0.9294	0.7790	0.8657	0.9340
0.7326	0.7548	0.7007	0.6855	0.7497	0.9438	0.7654	0.8489	0.9450
1.0000	1.0000	1.0000	1.0000	1.0000	0.9518	0.9518	0.9518	0.9518
$\overline{\Delta y}$		0.0567	0.0433	0.0030	%AAD	11.252	4.716	1.399
T=283.05K								
0.2250	0.2770	0.2179	0.2523	0.2604	0.9860	0.9478	1.0014	0.9998
0.4530	0.4950	0.4344	0.4561	0.4912	1.0550	0.9328	1.0233	1.0511
0.7060	0.7300	0.6810	0.6697	0.7267	1.0980	0.9063	1.0032	1.0923
0.8950	0.8890	0.8799	0.8603	0.9004	1.1150	0.8789	0.9513	1.1118
$\overline{\Delta y}$		0.0444	0.0382	0.0088	%AAD	13.523	6.971	0.645
T=288.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	1.0528	1.0528	1.0528	1.0528
0.1928	0.2247	0.1911	0.2230	0.2256	1.1174	1.1005	1.1525	1.1437
0.3419	0.3845	0.3350	0.3656	0.3823	1.1702	1.0963	1.1835	1.1873
0.4975	0.5419	0.4843	0.5000	0.5344	1.2155	1.0875	1.1955	1.2260

Table 4.12 (Continued)

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=288.15K								
0.6303	0.6601	0.6132	0.6118	0.6582	1.2480	1.0765	1.1898	1.2532
0.7331	0.7536	0.7154	0.7022	0.7524	1.2679	1.0656	1.1745	1.2707
1.0000	1.0000	1.0000	1.0000	1.0000	1.2810	1.2810	1.2810	1.2810
$\overline{\Delta y}$		0.0452	0.0325	0.0028	%AAD	9.611	3.593	1.062
T=293.05K								
0.2360	0.2730	0.2370	0.2689	0.2722	1.3070	1.2632	1.3352	1.3213
0.4480	0.4880	0.4430	0.4633	0.4871	1.3830	1.2608	1.3778	1.3896
0.7060	0.7270	0.6942	0.6846	0.7283	1.4430	1.2453	1.3710	1.4523
0.8950	0.8950	0.8868	0.8702	0.9015	1.4650	1.2246	1.3189	1.4835
$\overline{\Delta y}$		0.0305	0.0240	0.0024	%AAD	10.574	4.375	0.870
T=298.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	1.3806	1.3806	1.3806	1.3806
0.1864	0.2213	0.1912	0.2199	0.2178	1.4530	1.4496	1.5128	1.4887
0.3323	0.3794	0.3359	0.3639	0.3720	1.5338	1.4567	1.5664	1.5489
0.4964	0.5325	0.4956	0.5099	0.5335	1.5966	1.4588	1.5982	1.6071
0.6273	0.6551	0.6228	0.6221	0.6563	1.6430	1.4560	1.6023	1.6462
0.7312	0.7499	0.7248	0.7136	0.7518	1.6697	1.4509	1.5915	1.6725
1.0000	1.0000	1.0000	1.0000	1.0000	1.6896	1.6896	1.6896	1.6896
$\overline{\Delta y}$		0.0336	0.0218	0.0030	%AAD	7.675	2.701	0.891
T=303.15K								
0.110	0.1400	0.1196	0.1406	0.1357	1.6650	1.6434	1.6793	1.6507
0.200	0.2360	0.2075	0.2351	0.2319	1.7240	1.6544	1.7309	1.6957
0.320	0.3740	0.3356	0.3621	0.3668	1.7880	1.6672	1.7897	1.7572
0.460	0.5060	0.4691	0.4856	0.5018	1.8430	1.6763	1.8293	1.8149
0.630	0.6570	0.6344	0.6332	0.6624	1.8990	1.6808	1.8463	1.8761
0.750	0.7590	0.7488	0.7372	0.7700	1.9240	1.6796	1.8361	1.9108
0.800	0.8120	0.8022	0.7877	0.8194	1.9410	1.6778	1.8247	1.9248
$\overline{\Delta y}$		0.0238	0.0148	0.0062	%AAD	8.413	2.205	1.210
T=308.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	1.7829	1.7829	1.7829	1.7829
0.1763	0.2108	0.1854	0.2100	0.2046	1.8905	1.8751	1.9485	1.9021
0.3391	0.3765	0.3500	0.3742	0.3768	1.9835	1.9021	2.0432	1.9932
0.4953	0.5310	0.5039	0.5164	0.5310	2.0659	1.9210	2.0985	2.0690
0.6237	0.6486	0.6289	0.6287	0.6524	2.1219	1.9313	2.1182	2.1227
0.7300	0.7469	0.7322	0.7229	-	2.1589	1.9363	2.1162	-
1.0000	1.0000	1.0000	1.0000	1.0000	2.1894	2.1894	2.1894	2.1894
$\overline{\Delta y}$		0.0227	0.0124	0.0026	%AAD	6.245	1.963	0.322

Table 4.13 Results of VLE Calculations for R32 (1) / R125 (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=268.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.5713	0.5713	0.5713	0.5713
0.1966	0.2282	0.2369	0.2844	0.2436	0.6068	0.6041	0.6488	0.6169
0.3494	0.3979	0.3970	0.4344	0.4010	0.6343	0.6286	0.6956	0.6445
0.4929	0.5363	0.5363	0.5529	0.5355	0.6588	0.6481	0.7250	0.6644
0.6265	0.6578	0.6603	0.6574	0.6555	0.6767	0.6635	0.7421	0.6786
0.7323	0.7542	0.7566	0.7422	0.7500	0.6866	0.6740	0.7491	0.6869
1.0000	1.0000	1.0000	1.0000	1.0000	0.6938	0.6938	0.6938	0.6938
$\overline{\Delta y}$		0.0029	0.0243	0.0052	%AAD	1.353	9.080	0.889
T=273.15K								
0.0550	0.0770	0.0704	0.0946	0.0741	0.6910	0.6787	0.6873	0.6863
0.2440	0.2870	0.2873	0.3322	0.2935	0.7540	0.7198	0.7795	0.7355
0.4010	0.4580	0.4474	0.4769	0.4498	0.7890	0.7481	0.8293	0.7664
0.5140	0.5600	0.5559	0.5690	0.5546	0.8020	0.7656	0.8541	0.7841
0.6460	0.6820	0.6783	0.6733	0.6735	0.0813	0.7836	0.8730	0.8003
0.7460	0.7700	0.7693	0.7548	0.7629	0.8160	0.7954	0.8803	0.8097
0.8150	0.8190	0.8318	0.8143	0.8255	0.8180	0.8028	0.8816	0.8147
0.8950	0.8920	0.9043	0.8889	0.8994	0.8160	0.8107	0.8790	0.8190
$\overline{\Delta y}$		0.0064	0.0153	0.0066	%AAD	3.087	5.783	1.418
T=278.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.7854	0.7854	0.7854	0.7854
0.1883	0.2185	0.2257	0.2689	0.2321	0.8331	0.8281	0.8813	0.8432
0.3422	0.3827	0.3881	0.4234	0.3922	0.8722	0.8627	0.9471	0.8823
0.4984	0.5361	0.5406	0.5555	0.5402	0.9052	0.8927	0.9923	0.9133
0.6299	0.6603	0.6634	0.6607	0.6592	0.9294	0.9144	1.0165	0.9334
0.7326	0.7548	0.7573	0.7445	0.7514	0.9438	0.9294	1.0270	0.9456
1.0000	1.0000	1.0000	1.0000	1.0000	0.9518	0.9518	0.9518	0.9518
$\overline{\Delta y}$		0.0045	0.0243	0.0063	%AAD	1.242	8.435	0.777
T=283.05K								
0.2250	0.2770	0.2647	0.3060	0.2707	0.9860	0.9696	1.0388	0.9872
0.4530	0.4950	0.4965	0.5169	0.4974	1.0550	1.0254	1.1341	1.0478
0.7060	0.7300	0.7330	0.7230	0.7278	1.0980	1.0740	1.1864	1.0926
0.8950	0.8890	0.9047	0.8909	0.9004	1.1150	1.1030	1.1911	1.1126
$\overline{\Delta y}$		0.0081	0.0150	0.0056	%AAD	1.932	6.932	0.378
T=288.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	1.0528	1.0528	1.0528	1.0528
0.1928	0.2247	0.2282	0.2672	0.2342	1.1174	1.1138	1.1800	1.1304
0.3419	0.3845	0.3855	0.4176	0.3894	1.1702	1.1594	1.2652	1.1817
0.4975	0.5419	0.5383	0.5522	0.5380	1.2155	1.2005	1.3272	1.2245

Table 4.13 (Continued)

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=288.15K								
0.6303	0.6601	0.6631	0.6609	0.6595	1.2480	1.2312	1.3618	1.2532
0.7331	0.7536	0.7576	0.7463	0.7525	1.2679	1.2523	1.3775	1.2710
1.0000	1.0000	1.0000	1.0000	1.0000	1.2810	1.2810	1.2810	1.2810
$\overline{\Delta y}$		0.0030	0.0188	0.0040	%AAD	1.011	8.134	0.710
T=293.05K								
0.2360	0.2730	0.2737	0.3104	0.2792	1.3070	1.2936	1.3817	1.3125
0.4480	0.4880	0.4894	0.5087	0.4906	1.3830	1.3634	1.4999	1.3882
0.7060	0.7270	0.7324	0.7237	0.7279	1.4430	1.4322	1.5754	1.4526
0.8950	0.8950	0.9048	0.8926	0.9010	1.4650	1.4733	1.5862	1.4825
$\overline{\Delta y}$		0.0043	0.0160	0.0039	%AAD	0.940	7.903	0.663
T=298.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	1.3806	1.3806	1.3806	1.3806
0.1864	0.2213	0.2183	0.2524	0.2236	1.4530	1.4641	1.5406	1.4791
0.3323	0.3794	0.3725	0.4020	0.3765	1.5338	1.5237	1.6522	1.5464
0.4964	0.5325	0.5348	0.5476	0.5350	1.5966	1.5824	1.7415	1.6078
0.6273	0.6551	0.6589	0.6574	0.6560	1.6430	1.6237	1.7890	1.6470
0.7312	0.7499	0.7551	0.7453	0.7508	1.6697	1.6533	1.8124	1.6724
1.0000	1.0000	1.0000	1.0000	1.0000	1.6896	1.6896	1.6896	1.6896
$\overline{\Delta y}$		0.0042	0.0151	0.0019	%AAD	0.895	8.050	0.744
T=303.15K								
0.1140	0.1400	0.1355	0.1619	0.1399	1.6650	1.6321	1.6746	1.6384
0.2000	0.2360	0.2313	0.2634	0.2366	1.7240	1.6757	1.7658	1.6898
0.3280	0.3740	0.3662	0.3941	0.3701	1.7880	1.7353	1.8763	1.7568
0.4640	0.5060	0.5019	0.5173	0.5029	1.8430	1.7922	1.9652	1.8169
0.6340	0.6570	0.6641	0.6622	0.6614	1.8990	1.8549	2.0401	1.8773
0.7510	0.7590	0.7728	-	0.7686	1.9240	1.8933	-	1.9102
0.8050	0.8120	0.8223	-	0.8181	1.9410	1.9098	-	1.9230
$\overline{\Delta y}$		0.0075	0.0172	0.0040	%AAD	2.287	4.398	1.362
T=308.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	1.7829	1.7829	1.7829	1.7829
0.1763	0.2108	0.2035	0.2323	0.2083	1.8905	1.8892	1.9737	1.8979
0.3391	0.3765	0.3754	-	0.3789	1.9835	1.9759	-	1.9957
0.4953	0.5310	0.5306	-	-	2.0659	2.0495	-	-
1.0000	1.0000	1.0000	1.0000	1.0000	2.1894	2.1894	2.1894	2.1894
$\overline{\Delta y}$		0.0029	0.0215	0.0025	%AAD	0.415	4.401	0.505

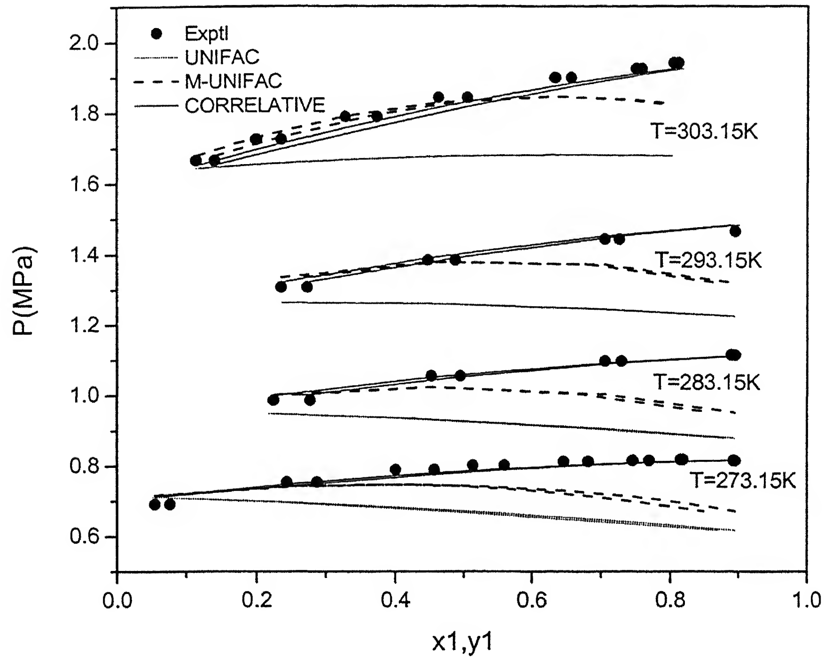

Figure 4.10 P-x-y diagram for R32 (1)/R125 (2) system using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

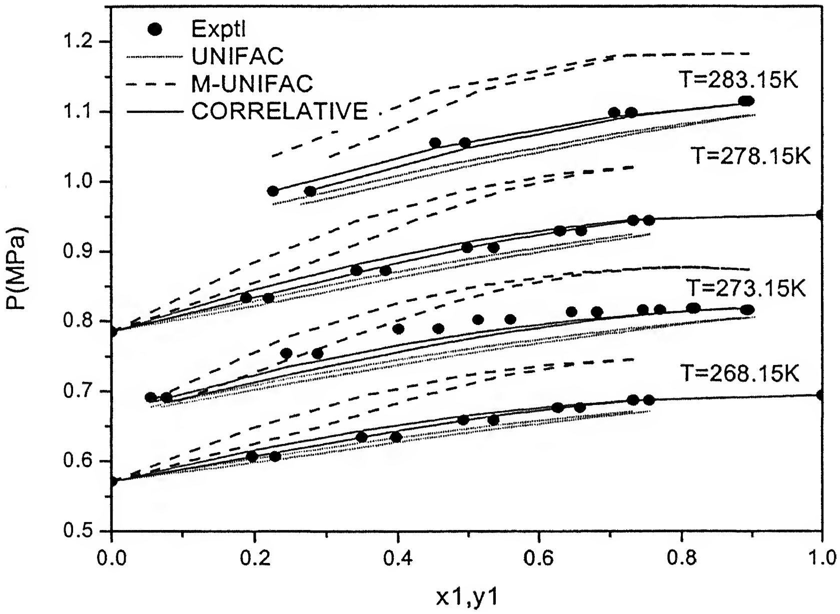

Figure 4.11 P-x-y diagram for R32 (1) / R125 (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

Table 4.14 Results of VLE Calculations for R32 (1) / R125 (2) System using Pure components as ref. fluids

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=268.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.5713	0.5713	0.5713	0.5713
0.1966	0.2282	0.2358	0.2833	0.2454	0.6068	0.6032	0.6476	0.6157
0.3494	0.3979	0.3958	0.4331	0.4025	0.6343	0.6270	0.6936	0.6441
0.4929	0.5363	0.5351	0.5518	0.5366	0.6588	0.6459	0.7224	0.6645
0.6265	0.6578	0.6593	0.6564	0.6560	0.6767	0.6608	0.7391	0.6789
0.7323	0.7542	0.7559	0.7416	0.7501	0.6866	0.6710	0.7457	0.6873
1.0000	1.0000	1.0000	1.0000	1.0000	0.6938	0.6938	0.6938	0.6938
$\overline{\Delta y}$		0.0028	0.0240	0.0056	%AAD	1.668	8.713	0.864
T=273.15K								
0.0550	0.0770	0.0700	0.0941	0.0748	0.6910	0.6783	0.6869	0.6841
0.2440	0.2870	0.2861	0.3308	0.2951	0.7540	0.7183	0.7775	0.7347
0.4010	0.4580	0.4461	0.4755	0.4510	0.7890	0.7457	0.8264	0.7664
0.5140	0.5600	0.5545	0.5676	0.5553	0.8020	0.7626	0.8506	0.7843
0.6460	0.6820	0.6771	0.6722	0.6735	0.0813	0.7799	0.8688	0.8006
0.7460	0.7700	0.7684	0.7539	0.7628	0.8160	0.7913	0.8757	0.8100
0.8150	0.8190	0.8312	0.8137	0.8252	0.8180	0.7984	0.8767	0.8149
0.8950	0.8920	0.9039	0.8886	0.8992	0.8160	0.8059	0.8738	0.8190
$\overline{\Delta y}$		0.0070	0.0151	0.0064	%AAD	3.467	5.371	1.456
T=278.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.7854	0.7854	0.7854	0.7854
0.1883	0.2185	0.2246	0.2677	0.2334	0.8331	0.8265	0.8793	0.8422
0.3422	0.3827	0.3867	0.4219	0.3933	0.8722	0.8601	0.9439	0.8822
0.4984	0.5361	0.5392	0.5541	0.5406	0.9052	0.8890	0.9880	0.9136
0.6299	0.6603	0.6621	0.6595	0.6592	0.9294	0.9098	1.0113	0.9337
0.7326	0.7548	0.7563	0.7435	0.7511	0.9438	0.9241	1.0211	0.9458
1.0000	1.0000	1.0000	1.0000	1.0000	0.9518	0.9518	0.9518	0.9518
$\overline{\Delta y}$		0.0033	0.0237	0.0070	%AAD	1.633	7.985	0.767
T=283.05K								
0.2250	0.2770	0.2635	0.3047	0.2719	0.9860	0.9674	1.0361	0.9867
0.4530	0.4950	0.4950	0.5155	0.4979	1.0550	1.0212	1.1293	1.0481
0.7060	0.7300	0.7319	0.7219	0.7275	1.0980	1.0678	1.1795	1.0928
0.8950	0.8890	0.9042	0.8904	0.8999	1.1150	1.0953	1.1828	1.1119
$\overline{\Delta y}$		0.0076	0.0144	0.0054	%AAD	2.402	6.403	0.369

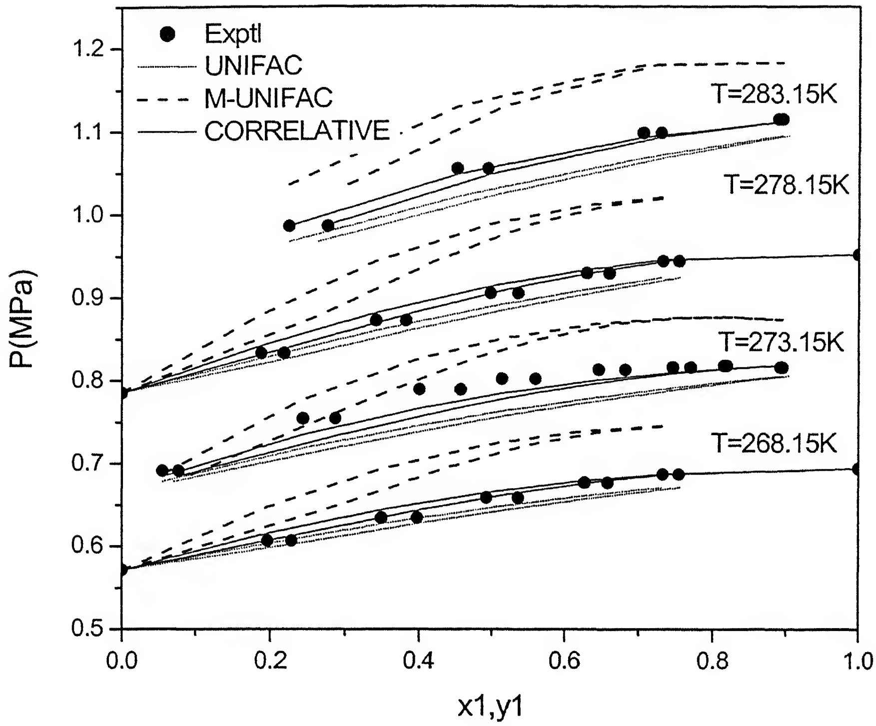

Figure 4.12 P-x-y diagram for R32 (1) / R125 (2) System using pure components as ref. fluids

Table 4.15 Results of VLE Calculations for R32 (1) / R134a (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=263.15K								
0.1384	0.3054	0.2614	0.3435	0.3056	0.2516	0.2365	0.2615	0.2515
0.2863	0.5180	0.4562	0.5229	0.5222	0.3047	0.2716	0.3135	0.3078
0.3239	0.5631	0.4970	0.5555	0.5658	0.3203	0.2799	0.3241	0.3222
0.4289	0.6504	0.5980	0.6321	0.6701	0.3576	0.3021	0.3496	0.3625
0.5408	0.7468	0.6903	0.6998	0.7596	0.3974	0.3240	0.3713	0.4056
0.6110	0.7996	0.7428	0.7391	0.8074	0.4322	0.3371	0.3828	0.4328
0.6682	0.8293	0.7832	0.7707	0.8425	0.4470	0.3473	0.3911	0.4550
0.7064	0.8544	0.8094	0.7920	0.8643	0.4652	0.3540	0.3961	0.4699
0.7554	0.8907	0.8421	0.8204	0.8906	0.4842	0.3624	0.4020	0.4891
0.8967	0.9509	0.9336	0.9129	0.9576	0.5427	0.3856	0.4151	0.5447
0.9233	0.9672	0.9506	0.9332	0.9690	0.5518	0.3899	0.4168	0.5553
$\overline{\Delta y}$		0.0465	0.04000	0.0072	%AAD	19.556	10.960	0.910
T=273.15K								
0.1425	0.2930	0.2662	0.3423	0.2989	0.3611	0.3476	0.3823	0.3638
0.2768	0.4927	0.4440	0.5075	0.4935	0.4322	0.3953	0.4516	0.4328
0.3173	0.5381	0.4888	0.5443	0.5414	0.4543	0.4089	0.4689	0.4538
0.4191	0.6391	0.5885	0.6218	0.6452	0.5033	0.4414	0.5067	0.5066
0.5356	0.7329	0.6862	0.6956	0.7422	0.5581	0.4764	0.5419	0.5675
0.6099	0.7912	0.7424	0.7386	0.7949	0.6049	0.4977	0.5609	0.6065
0.6550	0.8235	0.7745	0.7642	0.8242	0.6276	0.5101	0.5713	0.6303
0.6985	0.8454	0.8046	0.7892	0.8507	0.6512	0.5219	0.5806	0.6534
0.7567	0.8820	0.8437	0.8233	0.8837	0.6833	0.5374	0.5919	0.6843
0.8963	0.9533	0.9340	0.9150	0.9541	0.7579	0.5731	0.6135	0.7593
0.9216	0.9653	0.9501	0.9340	0.9658	0.7701	0.5794	0.6164	0.7730
$\overline{\Delta y}$		0.0394	0.0383	0.0034	%AAD	15.999	8.786	0.465
T=283.15K								
0.1362	0.2704	0.2538	0.3231	0.2750	0.5033	0.4901	0.5330	0.5043
0.2748	0.4706	0.4387	0.4974	0.4743	0.5967	0.5612	0.6351	0.5980
0.3166	0.5200	0.4851	0.5363	0.5236	0.6265	0.5816	0.6608	0.6265
0.4142	0.6216	0.5815	0.6131	0.6244	0.6917	0.6272	0.7138	0.6933
0.6094	0.7822	0.7408	0.7369	0.7825	0.8265	0.7121	0.7965	0.8284
0.6531	0.8126	0.7722	0.7627	0.8120	0.8567	0.7300	0.8119	0.8588
0.7565	0.8727	0.8433	0.8243	0.8757	0.9299	0.7715	0.8440	0.9317
0.8946	0.9498	0.9330	0.9155	0.9498	1.0322	0.8246	0.8779	1.0305
0.9192	0.9628	0.9486	0.9337	0.9620	1.0489	0.8339	0.8827	1.0483
$\overline{\Delta y}$		0.0295	0.0346	0.0022	%AAD	12.373	7.765	0.171

Table 4.15 (Continued)

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=293.15K								
0.1350	0.2564	0.2480	0.3110	0.2602	0.6848	0.6763	0.7290	0.6869
0.2751	0.4587	0.4343	0.4880	0.4578	0.8052	0.7770	0.8710	0.8087
0.3181	0.5024	0.4820	0.5285	0.5083	0.8449	0.8064	0.9079	0.8464
0.4138	0.5992	0.5769	0.6056	0.6075	0.9270	0.8698	0.9809	0.9307
0.5179	0.7031	0.6669	0.6770	0.6995	1.0215	0.9356	1.0490	1.0234
0.6095	0.7645	0.7381	0.7342	0.7699	1.1036	0.9913	1.1008	1.1058
0.6507	0.8034	0.7681	0.7593	0.7989	1.1423	1.0157	1.1220	1.1431
0.8948	0.9473	0.9326	0.9167	0.9462	1.3751	1.1548	1.2225	1.3690
0.9211	0.9608	0.9495	0.9361	0.9600	1.3966	1.1693	1.2304	1.3939
$\overline{\Delta y}$		0.0222	0.0302	0.0038	%AAD	8.603	6.180	0.268

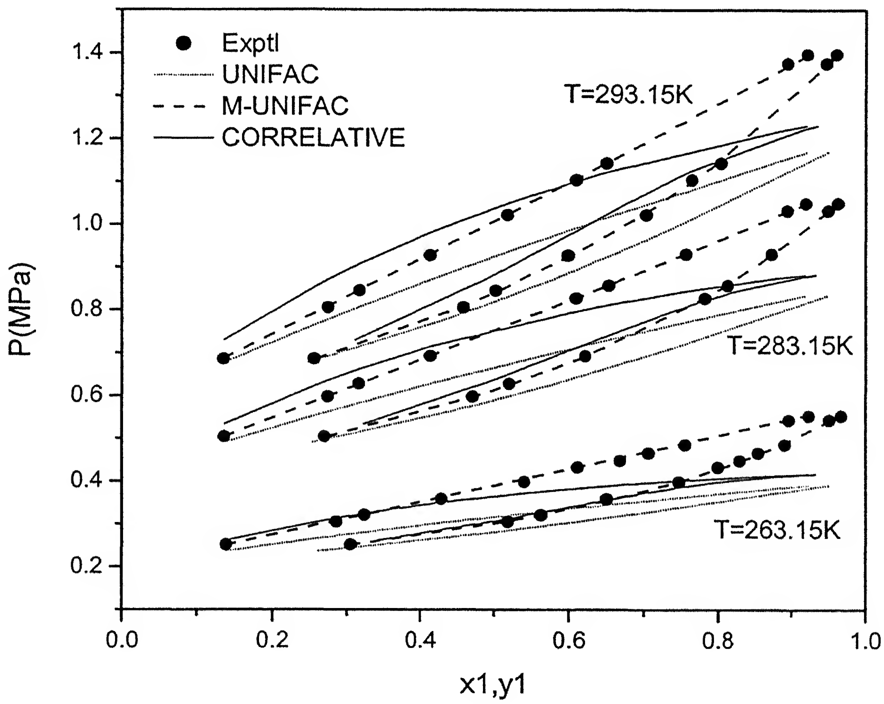

Figure 4.13 P-x-y diagram for R32 (1)/R134a (2) system using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

Table 4.16 Results of VLE Calculations for R32 (1) / R134a (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRE LATIVE	Exptl	UNIFAC	M-UNIFAC	CORRE LATIVE
T=263.15K								
0.1384	0.3054	0.3370	0.4382	0.3094	0.2516	0.2644	0.3056	0.2518
0.2863	0.5180	0.5415	0.6089	0.5239	0.3047	0.3270	0.3891	0.3084
0.3239	0.5631	0.5808	0.6376	0.5667	0.3203	0.3419	0.4062	0.3226
0.4289	0.6504	0.6741	0.7036	0.6698	0.3576	0.3821	0.4481	0.3627
0.5408	0.7468	0.7553	0.7616	0.7587	0.3974	0.4232	0.4865	0.4055
0.6110	0.7996	0.7998	0.7952	0.8065	0.4322	0.4484	0.5085	0.4325
0.6682	0.8293	0.8334	0.8222	0.8416	0.4470	0.4687	0.5256	0.4546
0.7064	0.8544	0.8547	0.8403	0.8635	0.4652	0.4821	0.5367	0.4695
0.7554	0.8907	0.8810	0.8640	0.8900	0.4842	0.4994	0.5505	0.4886
0.8967	0.9509	0.9517	0.9376	0.9575	0.5427	0.5491	0.5888	0.5444
0.9233	0.9672	0.9644	0.9528	0.9689	0.5518	0.5585	0.5956	0.5550
$\overline{\Delta y}$		0.0112	0.0406	0.0075	%AAD	4.569	18.585	0.904
T=273.15K								
0.1425	0.2930	0.3272	0.4190	0.3007	0.3611	0.3812	0.4338	0.3642
0.2768	0.4927	0.5128	0.5782	0.4939	0.4322	0.4583	0.5371	0.4332
0.3173	0.5381	0.5565	0.6114	0.5412	0.4543	0.4804	0.5627	0.4540
0.4191	0.6391	0.6506	0.6807	0.6444	0.5033	0.5340	0.6201	0.5065
0.5356	0.7329	0.7392	0.7458	0.7412	0.5581	0.5930	0.6765	0.5669
0.6099	0.7912	0.7885	0.7839	0.7940	0.6049	0.6297	0.7092	0.6058
0.6550	0.8235	0.8164	0.8067	0.8233	0.6276	0.6518	0.7282	0.6295
0.6985	0.8454	0.8422	0.8286	0.8500	0.6512	0.6731	0.7459	0.6526
0.7567	0.8820	0.8751	0.8584	0.8833	0.6833	0.7014	0.7690	0.6836
0.8963	0.9533	0.9488	0.9351	0.9542	0.7579	0.7695	0.8214	0.7591
0.9216	0.9653	0.9615	0.9501	0.9658	0.7701	0.7819	0.8305	0.7730
$\overline{\Delta y}$		0.0108	0.0397	0.0033	%AAD	4.245	17.205	0.418
T=283.15K								
0.1362	0.2704	0.3004	0.3836	0.2754	0.5033	0.5258	0.5871	0.5046
0.2748	0.4706	0.4925	0.5536	0.4735	0.5967	0.6313	0.7289	0.5979
0.3166	0.5200	0.5382	0.5896	0.5225	0.6265	0.6616	0.7647	0.6261
0.4142	0.6216	0.6306	0.6598	0.6231	0.6917	0.7303	0.8391	0.6924
0.6094	0.7822	0.7772	0.7725	0.7816	0.8265	0.8621	0.9639	0.8270
0.6531	0.8126	0.8055	0.7960	0.8114	0.8567	0.8910	0.9891	0.8577
0.7565	0.8727	0.8681	0.8519	0.8755	0.9299	0.9591	1.0458	0.9310
0.8946	0.9498	0.9449	0.9316	0.9500	1.0322	1.0502	1.1162	1.0309
0.9192	0.9628	0.9580	0.9468	0.9622	1.0489	1.0666	1.1281	1.0490
$\overline{\Delta y}$		0.0117	0.0428	0.0019	%AAD	4.038	15.822	0.116

Table 4.16(Continued)

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=293.15K								
0.1350	0.2564	0.2831	0.3577	0.2597	0.6848	0.7139	0.7848	0.6870
0.2751	0.4587	0.4750	0.5312	0.4564	0.8052	0.8518	0.9697	0.8078
0.3181	0.5024	0.5221	0.5693	0.5066	0.8449	0.8923	1.0176	0.8451
0.4138	0.5992	0.6141	0.6411	0.6060	0.9270	0.9803	1.1139	0.9290
0.5179	0.7031	0.6994	0.7074	0.6983	1.0215	1.0733	1.2066	1.0213
0.6095	0.7645	0.7658	0.7610	0.7693	1.1036	1.1540	1.2810	1.1040
0.6507	0.8034	0.7936	0.7845	0.7984	1.1423	1.1899	1.3128	1.1415
0.8948	0.9473	0.9418	0.9291	0.9465	1.3751	1.4034	1.4840	1.3708
0.9211	0.9608	0.9566	0.9461	0.9604	1.3966	1.4266	1.5008	1.3963
$\overline{\Delta y}$		0.0113	0.0380	0.0036	%AAD	4.378	15.569	0.149

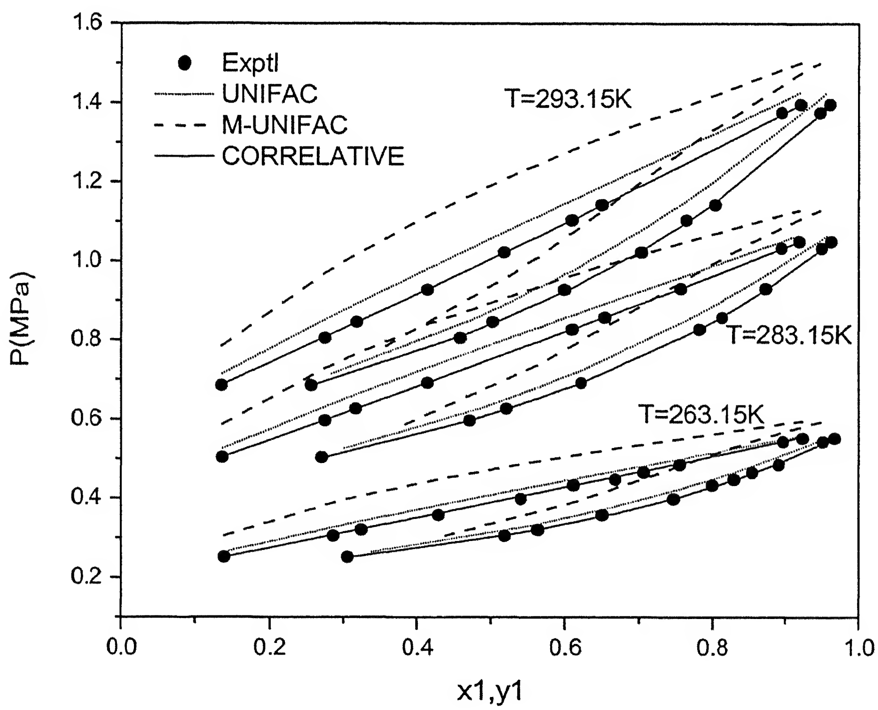

Figure 4.14 P-x-y diagram for R32 (1) / R134a (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

Table 4.17 Results of VLE Calculations for R32 (1) / R134a (2) System using Pure components as ref. fluids

x_1	y_1				P (MPa)			
Exptl	Exptl	Calculated			Exptl	Calculated		
		UNIFAC	M-UNIFAC	CORRELATIVE		UNIFAC	M-UNIFAC	CORRELATIVE
T=263.15K								
0.1384	0.3054	0.3367	0.4379	0.3100	0.2516	0.2641	0.3052	0.2518
0.2863	0.5180	0.5406	0.6080	0.5242	0.3047	0.3262	0.3881	0.3084
0.3239	0.5631	0.5799	0.6367	0.5671	0.3203	0.3411	0.4051	0.3228
0.4289	0.6504	0.6732	0.7027	0.6699	0.3576	0.3810	0.4467	0.3628
0.5408	0.7468	0.7545	0.7608	0.7588	0.3974	0.4217	0.4848	0.4056
0.6110	0.7996	0.7991	0.7945	0.8065	0.4322	0.4467	0.5065	0.4326
0.6682	0.8293	0.8327	0.8215	0.8417	0.4470	0.4668	0.5234	0.4547
0.7064	0.8544	0.8541	0.8397	0.8635	0.4652	0.4801	0.5344	0.4695
0.7554	0.8907	0.8805	0.8635	0.8900	0.4842	0.4972	0.5482	0.4886
0.8967	0.9509	0.9515	0.9374	0.9574	0.5427	0.5465	0.5861	0.5443
0.9233	0.9672	0.9642	0.9527	0.9689	0.5518	0.5558	0.5929	0.5549
$\overline{\Delta y}$		0.0108	0.0404	0.0076	%AAD	4.206	18.168	0.917
T=273.15K								
0.1425	0.2930	0.3262	0.4180	0.3009	0.3611	0.3804	0.4329	0.3642
0.2768	0.4927	0.5114	0.5768	0.4940	0.4322	0.4568	0.5351	0.4332
0.3173	0.5381	0.5551	0.6102	0.5412	0.4543	0.4786	0.5606	0.4540
0.4191	0.6391	0.6494	0.6794	0.6443	0.5033	0.5318	0.6173	0.5064
0.5356	0.7329	0.7381	0.7447	0.7410	0.5581	0.5901	0.6731	0.5668
0.6099	0.7912	0.7875	0.7830	0.7939	0.6049	0.6264	0.7055	0.6057
0.6550	0.8235	0.8155	0.8057	0.8233	0.6276	0.6483	0.7242	0.6295
0.6985	0.8454	0.8414	0.8278	0.8499	0.6512	0.6693	0.7418	0.6525
0.7567	0.8820	0.8745	0.8578	0.8833	0.6833	0.6973	0.7645	0.6835
0.8963	0.9533	0.9485	0.9348	0.9541	0.7579	0.7646	0.8163	0.7590
0.9216	0.9653	0.9613	0.9499	0.9658	0.7701	0.7768	0.8252	0.7728
$\overline{\Delta y}$		0.0106	0.0400	0.0032	%AAD	3.748	16.635	0.411
T=283.15K								
0.1362	0.2704	0.2992	0.3823	0.2754	0.5033	0.5247	0.5856	0.5047
0.2748	0.4706	0.4910	0.5520	0.4734	0.5967	0.6291	0.7258	0.5979
0.3166	0.5200	0.5366	0.5881	0.5224	0.6265	0.6590	0.7612	0.6261
0.4142	0.6216	0.6291	0.6583	0.6230	0.6917	0.7268	0.8349	0.6923
0.6094	0.7822	0.7762	0.7715	0.7816	0.8265	0.8570	0.9582	0.8269
0.6531	0.8126	0.8046	0.7950	0.8113	0.8567	0.8855	0.9830	0.8576
0.7565	0.8727	0.8675	0.8512	0.8755	0.9299	0.9527	1.0389	0.9309
0.8946	0.9498	0.9447	0.9312	0.9500	1.0322	1.0427	1.1081	1.0309
0.9192	0.9628	0.9578	0.9465	0.9622	1.0489	1.0588	1.1198	1.0490
$\overline{\Delta y}$		0.0114	0.0425	0.0019	%AAD	3.491	15.190	0.113

Table 4.17 (Continued)

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=293.15K								
0.1350	0.2564	0.2816	0.3562	0.2596	0.6848	0.7124	0.7827	0.6870
0.2751	0.4587	0.4733	0.5296	0.4563	0.8052	0.8486	0.9656	0.8077
0.3181	0.5024	0.5204	0.5677	0.5065	0.8449	0.8886	1.0130	0.8450
0.4138	0.5992	0.6126	0.6397	0.6059	0.9270	0.9755	1.1082	0.9288
0.5179	0.7031	0.6981	0.7061	0.6984	1.0215	1.0674	1.1998	1.0213
0.6095	0.7645	0.7647	0.7599	0.7693	1.1036	1.1470	1.2732	1.1039
0.6507	0.8034	0.7927	0.7835	0.7986	1.1423	1.1825	1.3045	1.1416
0.8948	0.9473	0.9416	-	-	1.3751	1.3930	-	-
0.9211	0.9608	-	-	0.9605	1.3966	-	-	1.3968
$\overline{\Delta y}$		0.0116	0.0434	0.0039	%AAD	4.132	17.240	0.120

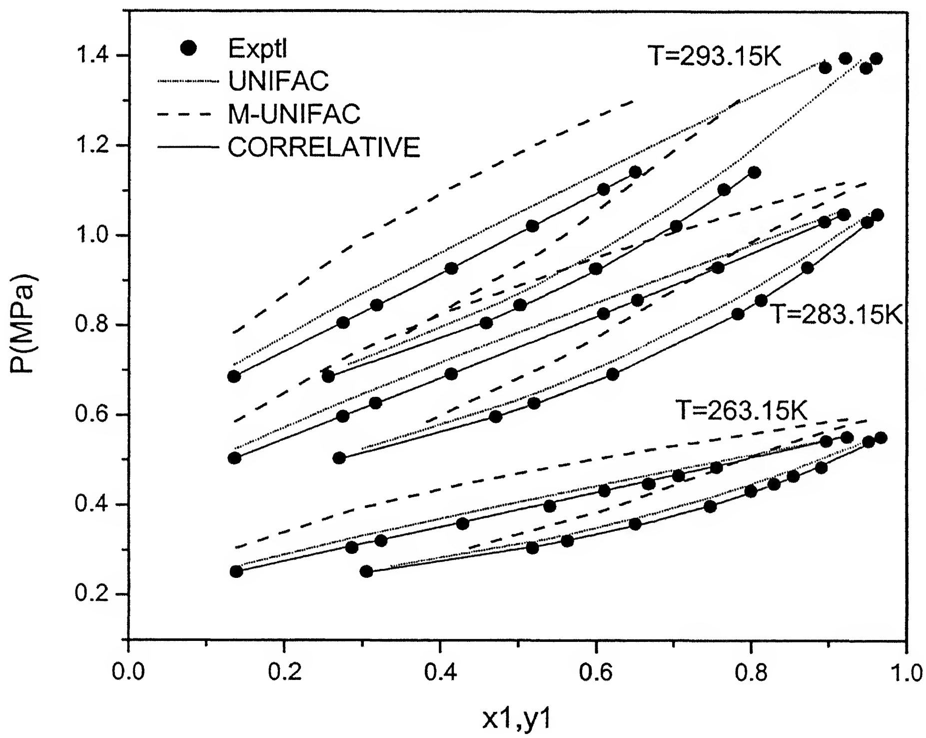

Figure 4.15 P-x-y diagram for R32 (1) / R134a (2) System using pure components as ref. fluids

Table 4.18 Results of VLE Calculations for R32 (1) / R142b (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=295.45K								
0.000	0.000	0.0000	0.0000	0.0000	0.310	0.310	0.310	0.310
0.122	0.403	0.3105	0.3627	0.4237	0.475	0.390	0.424	0.492
0.339	0.698	0.6391	0.6654	0.7054	0.775	0.579	0.649	0.797
0.427	0.758	0.7243	0.7373	0.7663	0.910	0.665	0.739	0.911
0.633	0.854	0.8633	0.8569	0.8668	1.143	0.880	0.944	1.166
0.772	0.914	0.9265	0.9168	0.9193	1.320	1.034	1.083	1.335
0.863	0.948	0.9594	0.9514	0.9514	1.422	1.138	1.176	1.448
1.000	1.000	1.0000	1.0000	1.0000	1.571	1.571	1.571	1.571
$\overline{\Delta y}$		0.0364	0.0171	0.0096	%AAD	22.451	16.401	1.899
T=304.55K								
0.000	0.000	0.0000	0.0000	0.0000	0.409	0.409	0.409	0.409
0.116	0.363	0.2932	0.3413	0.3895	0.610	0.508	0.549	0.623
0.329	0.667	0.6193	0.6456	0.6771	0.968	0.749	0.837	0.994
0.437	0.750	0.7241	0.7349	0.7548	1.143	0.886	0.981	1.169
0.619	0.840	0.8486	0.8430	0.8486	1.425	1.135	1.221	1.450
0.774	0.907	0.9224	0.9129	0.9123	1.677	1.362	1.428	1.688
0.868	0.944	0.9580	0.9504	0.9485	1.812	1.506	1.556	1.836
1.000	1.000	1.0000	1.0000	1.0000	1.998	1.998	1.998	1.998
$\overline{\Delta y}$		0.0303	0.0122	0.0100	%AAD	19.617	13.494	1.783
T=314.95K								
0.000	0.000	0.0000	0.0000	0.0000	0.549	0.549	0.549	0.549
0.111	0.340	0.2759	0.3195	0.3548	0.788	0.675	0.725	0.804
0.330	0.631	0.6087	0.6326	0.6536	1.238	1.002	1.114	1.278
0.435	0.725	0.7105	0.7204	0.7321	1.445	1.179	1.300	1.491
0.630	0.828	0.8449	0.8385	0.8382	1.845	1.534	1.646	1.873
0.770	0.898	0.9139	0.9044	0.9005	2.150	1.811	1.900	2.148
0.870	0.938	0.9544	0.9469	0.9432	2.323	2.019	2.089	2.352
1.000	1.000	1.0000	1.0000	1.0000	2.588	2.588	2.588	2.588
$\overline{\Delta y}$		0.0250	0.0088	0.0104	%AAD	16.264	10.081	1.872

Table 4.19 Results of VLE Calculations for R32 (1) / R142b (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=295.45K								
0.000	0.000	0.0000	0.0000	0.0000	0.310	0.310	0.310	0.310
0.122	0.403	0.3385	0.3956	0.4311	0.475	0.426	0.469	0.496
0.339	0.698	0.6639	0.6885	0.7035	0.775	0.662	0.745	0.795
0.427	0.758	0.7446	0.7559	0.7635	0.910	0.768	0.855	0.907
0.633	0.854	0.8741	0.8679	0.8653	1.143	1.039	1.115	1.161
0.772	0.914	0.9324	0.9239	0.9194	1.320	1.237	1.297	1.334
0.863	0.948	0.9626	0.9560	0.9522	1.422	1.373	1.421	1.451
1.000	1.000	1.0000	1.0000	1.0000	1.571	1.571	1.571	1.571
$\overline{\Delta y}$		0.0275	0.0085	0.0100	%AAD	9.874	2.584	1.996
T=304.55K								
0.000	0.000	0.0000	0.0000	0.0000	0.409	0.409	0.409	0.409
0.116	0.363	0.3121	0.3645	0.3945	0.610	0.545	0.594	0.626
0.329	0.667	0.6370	0.6619	0.6745	0.968	0.830	0.930	0.990
0.437	0.750	0.7378	0.7472	0.7517	1.143	0.993	1.099	1.162
0.619	0.840	0.8566	0.8508	0.8472	1.425	1.292	1.389	1.443
0.774	0.907	0.9265	0.9179	0.9126	1.677	1.570	1.647	1.687
0.868	0.944	0.9602	0.9535	0.9493	1.812	1.749	1.811	1.842
1.000	1.000	1.0000	1.0000	1.0000	1.998	1.998	1.998	1.998
$\overline{\Delta y}$		0.0242	0.0068	0.0098	%AAD	9.553	2.467	1.689
T=314.95K								
0.000	0.000	0.0000	0.0000	0.0000	0.549	0.549	0.549	0.549
0.111	0.340	0.2864	0.3336	0.3576	0.788	0.710	0.767	0.806
0.330	0.631	0.6184	0.6414	0.6504	1.238	1.078	1.201	1.272
0.435	0.725	0.7181	0.7269	0.7288	1.445	1.277	1.410	1.481
0.630	0.828	0.8492	0.8425	0.8371	1.845	1.685	1.807	1.865
0.770	0.898	0.9162	0.9073	0.9011	2.150	2.007	2.108	2.149
0.870	0.938	0.9555	0.9488	0.9442	2.323	2.254	2.337	2.363
1.000	1.000	1.0000	1.0000	1.0000	2.588	2.588	2.588	2.588
$\overline{\Delta y}$		0.0217	0.0089	0.0099	%AAD	8.807	2.114	1.734

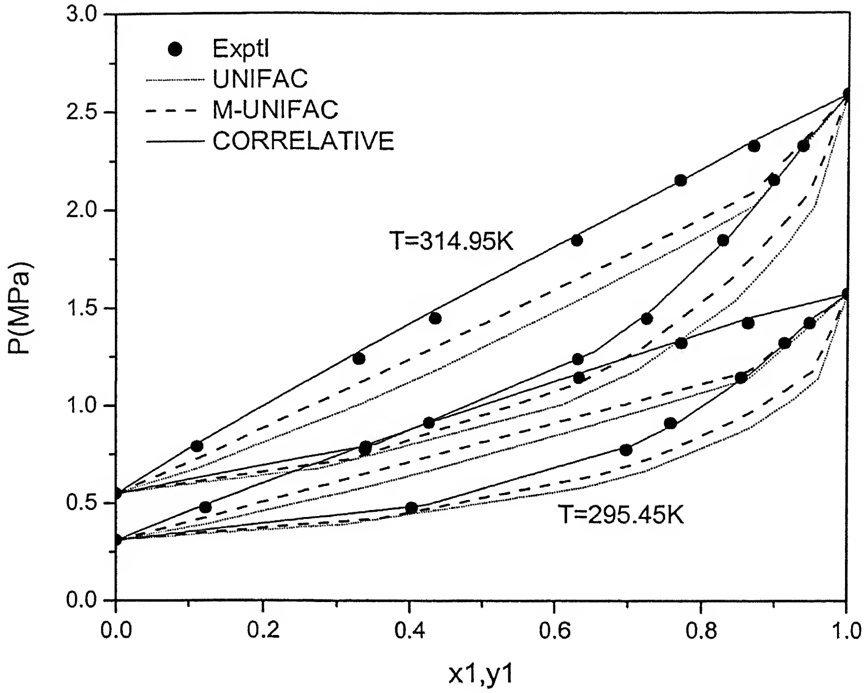

Figure 4.16 P-x-y diagram for R32 (1)/R142b (2) system using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

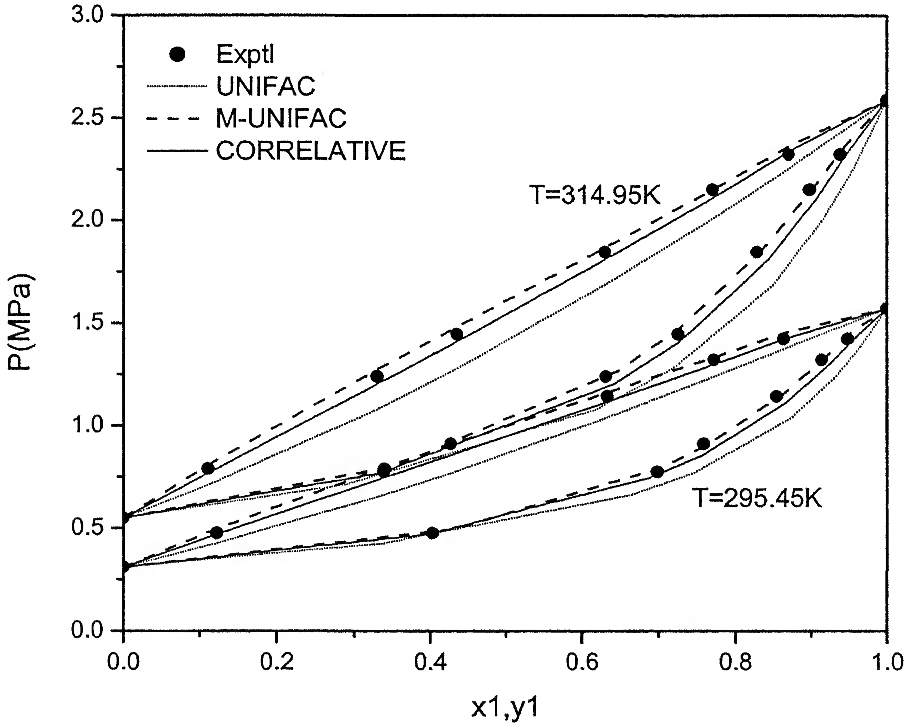

Figure 4.17 P-x-y diagram for R32 (1) / R142b (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

Table 4.20 Results of VLE Calculations for R32 (1) / R142b (2) System using Pure components as ref. fluids

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=295.45K								
0.000	0.000	0.0000	0.0000	0.0000	0.310	0.310	0.310	0.310
0.122	0.403	0.3385	0.3952	0.4311	0.475	0.426	0.469	0.496
0.339	0.698	0.6639	0.6868	0.7035	0.775	0.662	0.742	0.795
0.427	0.758	0.7446	0.7542	0.7635	0.910	0.768	0.851	0.907
0.633	0.854	0.8741	0.8667	0.8653	1.143	1.039	1.108	1.161
0.772	0.914	0.9324	0.9233	0.9194	1.320	1.237	1.288	1.334
0.863	0.948	0.9626	0.9556	0.9522	1.422	1.373	1.410	1.451
1.000	1.000	1.0000	1.0000	1.0000	1.571	1.571	1.571	1.571
$\overline{\Delta y}$		0.0275	0.0087	0.0100	%AAD	9.874	3.047	1.996
T=304.55K								
0.000	0.000	0.0000	0.0000	0.0000	0.409	0.409	0.409	0.409
0.116	0.363	0.3121	0.3631	0.3945	0.610	0.545	0.595	0.626
0.329	0.667	0.6370	0.6596	0.6745	0.968	0.830	0.928	0.990
0.437	0.750	0.7378	0.7452	0.7517	1.143	0.993	1.095	1.162
0.619	0.840	0.8566	0.8495	0.8472	1.425	1.292	1.382	1.443
0.774	0.907	0.9265	-	0.9126	1.677	1.570	-	1.687
0.868	0.944	0.9602	-	0.9493	1.812	1.749	-	1.842
1.000	1.000	1.0000	1.0000	1.0000	1.998	1.998	1.998	1.998
$\overline{\Delta y}$		0.0242	0.0055	0.0098	%AAD	9.553	3.487	1.689
T=314.95K								
0.000	0.000	0.0000	0.0000	0.0000	0.549	0.549	0.549	0.549
0.111	0.340	0.2864	0.3314	0.3576	0.788	0.710	0.769	0.806
0.330	0.631	0.6184	0.6386	0.6504	1.238	1.078	1.199	1.272
0.435	0.725	0.7181	0.7245	0.7288	1.445	1.277	1.405	1.481
0.630	0.828	0.8492	-	0.8371	1.845	1.685	-	1.865
0.770	0.898	0.9162	-	0.9011	2.150	2.007	-	2.149
0.870	0.938	0.9555	-	0.9442	2.323	2.254	-	2.363
1.000	1.000	1.0000	1.0000	1.0000	2.588	2.588	2.588	2.588
$\overline{\Delta y}$		0.0217	0.0056	0.0099	%AAD	8.807	2.781	1.734

Table 4.21 Results of VLE Calculations for R32 (1) / R143a (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=263.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.4501	0.4501	0.4501	0.4501
0.0996	0.1384	0.1096	0.1407	0.1469	0.4754	0.3801	0.3910	0.4781
0.1842	0.2448	0.1997	0.2388	0.2524	0.4970	0.3839	0.4050	0.4999
0.2938	0.3663	0.3129	0.3468	0.3712	0.5241	0.3884	0.4184	0.5241
0.4189	0.4798	0.4383	0.4541	0.4900	0.5455	0.3930	0.4279	0.5465
0.5664	0.6112	0.5825	0.5709	0.6173	0.5651	0.3976	0.4325	0.5667
0.6564	0.6984	0.6694	0.6425	0.6921	0.5777	0.3999	0.4318	0.5760
0.7908	0.8076	0.7984	0.7588	0.8050	0.5896	0.4030	0.4252	0.5856
0.8846	0.8890	0.8885	0.8536	0.8881	0.5850	0.4047	0.4159	0.5890
1.0000	1.0000	1.0000	1.0000	1.0000	0.5804	0.5804	0.5804	0.5804
$\overline{\Delta y}$		0.0295	0.0292	0.0059	%AAD	27.444	22.939	0.412
T=273.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.6218	0.6218	0.6218	0.6218
0.0954	0.1414	0.1082	0.1369	0.1390	0.6563	0.5434	0.5597	0.6568
0.1804	0.2538	0.2010	0.2380	0.2453	0.6861	0.5511	0.5822	0.6873
0.2849	0.3514	0.3111	0.3443	0.3597	0.7218	0.5600	0.6036	0.7196
0.4162	0.4822	0.4445	0.4605	0.4862	0.7538	0.5703	0.6219	0.7532
0.5653	0.6125	0.5908	0.5813	0.6166	0.7829	0.5809	0.6327	0.7829
0.6571	0.7020	0.6788	0.6554	0.6938	0.7977	0.5870	0.6343	0.7969
0.7905	0.8069	0.8048	0.7702	0.8066	0.8164	0.5950	0.6291	0.8117
0.8845	0.8901	0.8926	0.8624	0.8896	0.8140	0.6003	0.6192	0.8178
1.0000	1.0000	1.0000	1.0000	1.0000	0.8118	0.8118	0.8118	0.8118
$\overline{\Delta y}$		0.0267	0.0239	0.0045	%AAD	23.653	18.785	0.222
T=283.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.8399	0.8399	0.8399	0.8399
0.0928	0.1366	0.1075	0.1340	0.1330	0.8843	0.7561	0.7808	0.8824
0.1797	0.2461	0.2042	0.2390	0.2410	0.9252	0.7698	0.8158	0.9243
0.2894	0.3524	0.3216	0.3525	0.3609	0.9708	0.7864	0.8507	0.9703
0.4197	0.4810	0.4550	0.4699	0.4872	1.0151	0.8050	0.8804	1.0159
0.5664	0.6119	0.5992	0.5913	0.6169	1.0567	0.8246	0.9005	1.0566
0.6537	0.7062	0.6824	0.6625	0.6913	1.0776	0.8358	0.9060	1.0757
0.7918	0.8080	0.8111	0.7810	0.8089	1.1026	0.8525	0.9044	1.0984
0.8835	0.8918	0.8950	0.8688	0.8900	1.1039	0.8631	0.8953	1.1081
1.0000	1.0000	1.0000	1.0000	1.0000	1.1064	1.1064	1.1064	1.1064
$\overline{\Delta y}$		0.0213	0.0169	0.0058	%AAD	19.987	14.591	0.173
T=293.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	1.1107	1.1107	1.1107	1.1107
0.1096	0.1653	0.1283	0.1550	0.1517	1.1876	1.0321	1.0766	1.1744
0.1986	0.2706	0.2277	0.2600	0.2585	1.2367	1.0545	1.1270	1.2294
0.3136	0.3942	0.3509	0.3775	0.3813	1.2951	1.0826	1.1793	1.2916

Table 4.21 (Continued)

x_1	y_1				P (MPa)			
Exptl	Exptl	Calculated			Exptl	Calculated		
		UNIFAC	M-UNIFAC	CORRELATIVE		UNIFAC	M-UNIFAC	CORRELATIVE
T=293.15K								
0.4474	0.5084	0.4877	0.4980	0.5094	1.3500	1.1139	1.2241	1.3522
0.6001	0.6456	0.6366	0.6258	0.6445	1.4066	1.1482	1.2563	1.4071
0.6582	0.6959	0.6916	0.6740	0.6946	1.4245	1.1608	1.2633	1.4242
0.7891	0.8074	0.8124	0.7864	0.8072	1.4586	1.1885	1.2683	1.4549
0.8858	0.8939	0.8995	0.8771	0.8929	1.4671	1.2084	1.2611	1.4704
1.0000	1.0000	1.0000	1.0000	1.0000	1.4739	1.4739	1.4739	1.4739
$\overline{\Delta y}$		0.0210	0.0160	0.0054	%AAD	16.844	10.695	0.333
T=303.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	1.4340	1.4340	1.4340	1.4340
0.1165	0.1563	0.1370	0.1616	0.1563	1.5329	1.3774	1.4472	1.5264
0.1844	0.2494	0.2135	0.2423	0.2372	1.5872	1.4034	1.5021	1.5808
0.3003	0.3694	0.3391	0.3640	0.3625	1.6628	1.4470	1.5811	1.6639
0.4382	0.4977	0.4813	0.4920	0.4967	1.7422	1.4973	1.6534	1.7476
0.6011	0.6463	0.6406	0.6314	0.6432	1.8203	1.5549	1.7106	1.8268
0.6590	0.6922	0.6952	0.6802	0.6937	1.8471	1.5750	1.7238	1.8499
0.7927	0.8087	0.8181	0.7956	0.8102	1.8994	1.6206	1.7396	1.8931
0.8839	0.8912	0.8993	0.8800	0.8916	1.9119	1.6511	1.7376	1.9143
1.0000	1.0000	1.0000	1.0000	1.0000	1.9269	1.9269	1.9269	1.9269
$\overline{\Delta y}$		0.0160	0.0094	0.0033	%AAD	13.299	6.399	0.271
T=313.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	1.8318	1.8318	1.8318	1.8318
0.1099	0.1470	0.1292	0.1497	0.1435	1.9465	1.7978	1.8955	1.9384
0.1847	0.2361	0.2136	0.2383	0.2314	2.0211	1.8394	1.9793	2.0144
0.3008	0.3586	0.3396	0.3610	0.3563	2.1153	1.9032	2.0910	2.1206
0.4385	0.4908	0.4818	-	-	2.2215	1.9774	-	-
0.5926	0.6343	0.6333	-	-	2.3287	2.0592	-	-
0.6535	0.6881	0.6909	-	-	2.3648	2.0910	-	-
0.7884	0.8043	0.8150	-	-	2.4297	2.1610	-	-
0.8827	0.8901	-	-	-	2.4570	-	-	-
1.0000	1.0000	1.0000	1.0000	1.0000	2.4810	2.4810	2.4810	2.4810
$\overline{\Delta y}$		0.0118	0.0024	0.0035	%AAD	10.265	1.946	0.335

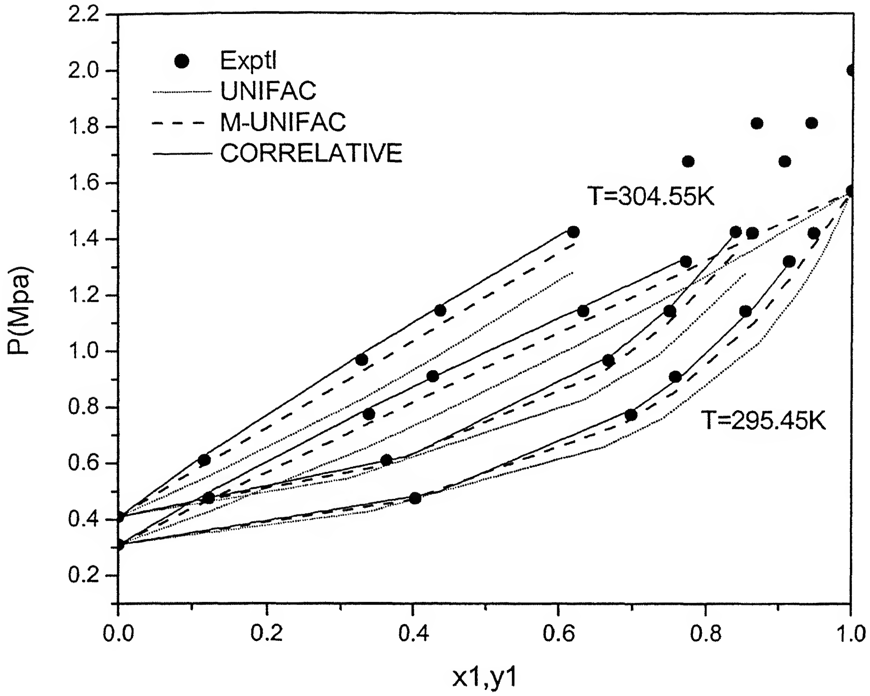

Figure 4.18 P-x-y diagram for R32 (1) / R142b (2) System using pure components as ref. fluids

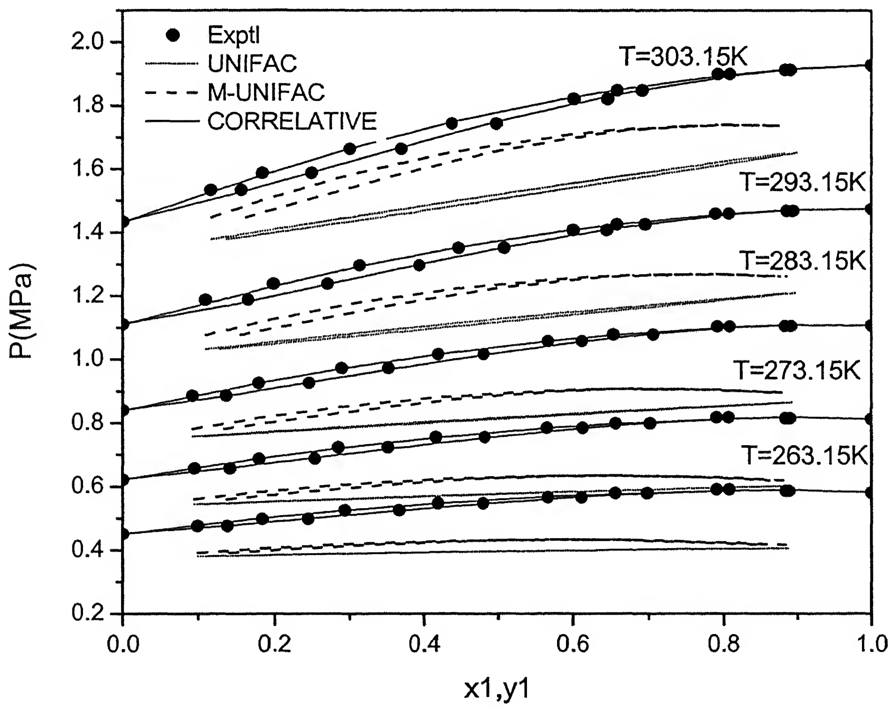

Figure 4.19 P-x-y diagram for R32 (1) / 143a (2) system using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

Table 4.22 Results of VLE Calculations for R32 (1) / R143a (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=263.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.4501	0.4501	0.4501	0.4501
0.0996	0.1384	0.1308	0.1683	0.1484	0.4754	0.4539	0.4709	0.4780
0.1842	0.2448	0.2333	0.2776	0.2538	0.4970	0.4687	0.4999	0.5002
0.2938	0.3663	0.3566	0.3923	0.3714	0.5241	0.4871	0.5297	0.5244
0.4189	0.4798	0.4868	0.5018	0.4894	0.5455	0.5072	0.5551	0.5467
0.5664	0.6112	0.6291	0.6173	0.6164	0.5651	0.5299	0.5755	0.5667
0.6564	0.6984	0.7110	0.6863	0.6916	0.5777	0.5432	0.5836	0.5758
0.7908	0.8076	0.8281	0.7946	0.8053	0.5896	0.5626	0.5894	0.5855
0.8846	0.8890	0.9067	0.8788	0.8888	0.5850	0.5758	0.5884	0.5892
1.0000	1.0000	1.0000	1.0000	1.0000	0.5804	0.5804	0.5804	0.5804
$\overline{\Delta y}$		0.0131	0.0190	0.0060	%AAD	5.330	0.981	0.435
T=273.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.6218	0.6218	0.6218	0.6218
0.0954	0.1414	0.1247	0.1585	0.1402	0.6563	0.6295	0.6525	0.6568
0.1804	0.2538	0.2277	0.2690	0.2461	0.6861	0.6506	0.6935	0.6876
0.2849	0.3514	0.3458	0.3806	0.3597	0.7218	0.6756	0.7342	0.7201
0.4162	0.4822	0.4833	0.4984	0.4853	0.7538	0.7059	0.7733	0.7534
0.5653	0.6125	0.6277	0.6180	0.6157	0.7829	0.7389	0.8045	0.7826
0.6571	0.7020	0.7117	0.6897	0.6933	0.7977	0.7587	0.8174	0.7965
0.7905	0.8069	0.8281	0.7981	0.8069	0.8164	0.7868	0.8279	0.8114
0.8845	0.8901	0.9068	0.8819	0.8903	0.8140	0.8063	0.8287	0.8179
1.0000	1.0000	1.0000	1.0000	1.0000	0.8118	0.8118	0.8118	0.8118
$\overline{\Delta y}$		0.0140	0.0141	0.0041	%AAD	4.637	1.801	0.234
T=283.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.8399	0.8399	0.8399	0.8399
0.0928	0.1366	0.1203	0.1507	0.1339	0.8843	0.8526	0.8847	0.8824
0.1797	0.2461	0.2252	0.2632	0.2416	0.9252	0.8822	0.9418	0.9248
0.2894	0.3524	0.3487	0.3806	0.3607	0.9708	0.9186	1.0006	0.9708
0.4197	0.4810	0.4850	0.4991	0.4861	1.0151	0.9604	1.0548	1.0159
0.5664	0.6119	0.6274	0.6193	0.6160	1.0567	1.0059	1.0990	1.0561
0.6537	0.7062	0.7077	0.6888	0.6907	1.0776	1.0325	1.1177	1.0751
0.7918	0.8080	0.8288	0.8021	0.8092	1.1026	1.0738	1.1359	1.0980
0.8835	0.8918	0.9058	0.8836	0.8906	1.1039	1.1008	1.1396	1.1083
1.0000	1.0000	1.0000	1.0000	1.0000	1.1064	1.1064	1.1064	1.1064
$\overline{\Delta y}$		0.0121	0.0146	0.0054	%AAD	3.861	2.850	0.180
T=293.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	1.1107	1.1107	1.1107	1.1107
0.1096	0.1653	0.1393	0.1691	0.1523	1.1876	1.1394	1.1938	1.1746
0.1986	0.2706	0.2446	0.2790	0.2587	1.2367	1.1800	1.2688	1.2300
0.3136	0.3942	0.3720	0.3987	0.3807	1.2951	1.2312	1.3488	1.2919

Table 4.22 (Continued)

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=293.15K								
0.4474	0.5084	0.5100	0.5194	0.5084	1.3500	1.2892	1.4216	1.3520
0.6001	0.6456	0.6567	0.6458	0.6439	1.4066	1.3538	1.4822	1.4064
0.6582	0.6959	0.7100	0.6930	0.6941	1.4245	1.3780	1.4993	1.4234
0.7891	0.8074	0.8255	0.8019	0.8075	1.4586	1.4321	1.5261	1.4544
0.8858	0.8939	0.9072	0.8877	0.8935	1.4671	1.4717	1.5347	1.4709
1.0000	1.0000	1.0000	1.0000	1.0000	1.4739	1.4739	1.4739	1.4739
$\overline{\Delta y}$		0.0166	0.0053	0.0053	%AAD	3.404	4.053	0.333
T=303.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	1.4340	1.4340	1.4340	1.4340
0.1165	0.1563	0.1453	0.1721	0.1568	1.5329	1.4887	1.5697	1.5265
0.1844	0.2494	0.2250	0.2553	0.2374	1.5872	1.5294	1.6449	1.5812
0.3003	0.3694	0.3537	0.3787	0.3620	1.6628	1.5978	1.7547	1.6641
0.4382	0.4977	0.4969	0.5066	0.4959	1.7422	1.6775	1.8589	1.7472
0.6011	0.6463	0.6545	0.6450	0.6427	1.8203	1.7699	1.9499	1.8259
0.6590	0.6922	0.7079	0.6930	0.6935	1.8471	1.8024	1.9742	1.8490
0.7927	0.8087	0.8269	0.8062	0.8107	1.8994	1.8771	2.0148	1.8930
0.8839	0.8912	0.9047	0.8874	0.8922	1.9119	1.9277	2.0293	1.9154
1.0000	1.0000	1.0000	1.0000	1.0000	1.9269	1.9269	1.9269	1.9269
$\overline{\Delta y}$		0.0134	0.0060	0.0037	%AAD	2.668	5.560	0.262

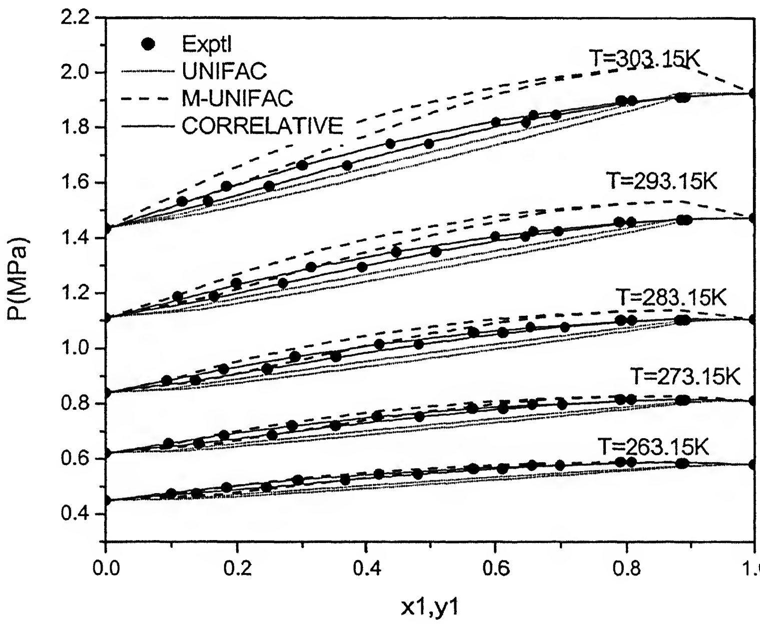

Figure 4.20 P-x-y diagram for R32 (1) / R143a (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

Table 4.23 Results of VLE Calculations for R32 (1) / R143a (2) System using Pure components as ref. fluids

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=263.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.4501	0.4501	0.4501	0.4501
0.0996	0.1384	0.1305	0.1678	0.1484	0.4754	0.4525	0.4694	0.4779
0.1842	0.2448	0.2329	0.2770	0.2537	0.4970	0.4671	0.4981	0.5002
0.2938	0.3663	0.3562	0.3917	0.3714	0.5241	0.4854	0.5276	0.5243
0.4189	0.4798	0.4863	0.5013	0.4895	0.5455	0.5052	0.5527	0.5466
0.5664	0.6112	0.6288	0.6170	0.6166	0.5651	0.5277	0.5730	0.5666
0.6564	0.6984	0.7109	0.6862	0.6917	0.5777	0.5409	0.5810	0.5759
0.7908	0.8076	0.8280	0.7948	0.8056	0.5896	0.5601	0.5868	0.5856
0.8846	0.8890	0.9066	0.8790	0.8890	0.5850	0.5732	0.5859	0.5894
1.0000	1.0000	1.0000	1.0000	1.0000	0.5804	0.5804	0.5804	0.5804
$\overline{\Delta y}$		0.0131	0.0187	0.0060	%AAD	5.705	0.761	0.431
T=273.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.6218	0.6218	0.6218	0.6218
0.0954	0.1414	0.1244	0.1581	0.1402	0.6563	0.6269	0.6497	0.6568
0.1804	0.2538	0.2273	0.2684	0.2460	0.6861	0.6477	0.6902	0.6876
0.2849	0.3514	0.3453	0.3799	0.3596	0.7218	0.6723	0.7305	0.7200
0.4162	0.4822	0.4827	0.4978	0.4853	0.7538	0.7021	0.7691	0.7533
0.5653	0.6125	0.6272	0.6174	0.6157	0.7829	0.7347	0.7998	0.7826
0.6571	0.7020	0.7113	0.6893	0.6933	0.7977	0.7542	0.8125	0.7965
0.7905	0.8069	0.8279	0.7979	0.8070	0.8164	0.7819	0.8228	0.8114
0.8845	0.8901	0.9066	0.8818	0.8904	0.8140	0.8011	0.8236	0.8180
1.0000	1.0000	1.0000	1.0000	1.0000	0.8118	0.8118	0.8118	0.8118
$\overline{\Delta y}$		0.0140	0.0138	0.0041	%AAD	5.151	1.351	0.239
T=283.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.8399	0.8399	0.8399	0.8399
0.0928	0.1366	0.1200	0.1503	0.1338	0.8843	0.8486	0.8805	0.8825
0.1797	0.2461	0.2247	0.2626	0.2415	0.9252	0.8778	0.9368	0.9249
0.2894	0.3524	0.3483	0.3800	0.3605	0.9708	0.9135	0.9949	0.9708
0.4197	0.4810	0.4844	0.4985	0.4862	1.0151	0.9546	1.0483	1.0159
0.5664	0.6119	0.6269	0.6187	0.6160	1.0567	0.9994	1.0918	1.0560
0.6537	0.7062	0.7072	0.6883	0.6906	1.0776	1.0255	1.1101	1.0750
0.7918	0.8080	0.8285	0.8018	0.8092	1.1026	1.0661	1.1277	1.0979
0.8835	0.8918	0.9056	0.8834	0.8906	1.1039	1.0926	1.1312	1.1082
1.0000	1.0000	1.0000	1.0000	1.0000	1.1064	1.1064	1.1064	1.1064
$\overline{\Delta y}$		0.0120	0.0143	0.0054	%AAD	4.452	2.315	0.180

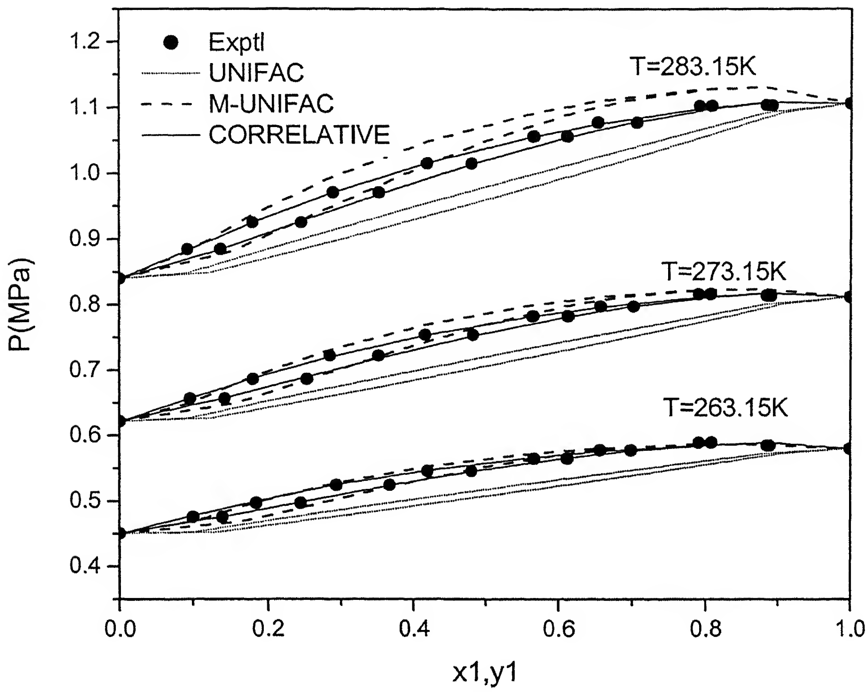

Figure 4.21 P-x-y diagram for R32 (1) / R143a (2) System using pure components as ref. fluids

Table 4.24 Results of VLE Calculations for R32 (1) / R227ea (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=283.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.2775	0.2775	0.2775	0.2775
0.1714	0.4424	0.4401	0.4015	0.4550	0.4418	0.5140	0.4732	0.4491
0.2790	0.5850	0.5611	0.5435	0.5975	0.5382	0.6022	0.5592	0.5502
0.3320	0.6363	0.6046	0.5981	0.6501	0.5844	0.6384	0.5995	0.5984
0.4320	0.7186	0.6707	0.6834	0.7297	0.6720	0.6966	0.6722	0.6863
0.5476	0.7905	0.7330	0.7631	0.8013	0.7750	0.7512	0.7519	0.7843
0.6159	0.8280	0.7667	0.8041	0.8372	0.8360	0.7786	0.7973	0.8412
0.7312	0.8832	0.8237	0.8669	0.8911	0.9194	0.8187	0.8722	0.9367
0.8240	0.9240	0.8741	0.9140	0.9304	0.9962	0.8457	0.9317	1.0139
1.0000	1.0000	1.0000	1.0000	1.0000	1.1092	1.1092	1.1092	1.1092
$\overline{\Delta y}$		0.0418	0.0292	0.0105	%AAD	9.641	4.103	1.737
T=298.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.4560	0.4560	0.4560	0.4560
0.1020	0.2940	0.3044	0.2634	0.2847	0.6070	0.6945	0.6427	0.5973
0.2190	0.4860	0.4850	0.4553	0.4822	0.7640	0.8708	0.7934	0.7546
0.3210	0.6030	0.5834	0.5726	0.5987	0.8960	0.9959	0.9180	0.8857
0.4230	0.6930	0.6563	0.6632	0.6868	1.0250	1.0999	1.0372	1.0121
0.4920	0.7530	0.6978	0.7149	0.7362	1.1140	1.1611	1.1154	1.0954
0.6520	0.8460	0.7838	0.8166	0.8319	1.3000	1.2818	1.2913	1.2850
0.7860	0.9080	0.8559	0.8904	0.9003	1.4530	1.3653	1.4361	1.4435
0.8770	0.9490	0.9106	0.9377	0.9436	1.5520	1.4133	1.5347	1.5526
1.0000	1.0000	1.0000	1.0000	1.0000	1.6860	1.6860	1.6860	1.6860
$\overline{\Delta y}$		0.0345	0.0272	0.0085	%AAD	8.432	2.056	1.093
T=303.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.5303	0.5303	0.5303	0.5303
0.1386	0.3428	0.3661	0.3270	0.3439	0.7354	0.8652	0.7910	0.7443
0.2308	0.4849	0.4916	0.4645	0.4832	0.8724	1.0183	0.9254	0.8803
0.3278	0.5901	0.5829	0.5730	0.5913	1.0104	1.1547	1.0610	1.0183
0.4113	0.6647	0.6437	0.6479	0.6648	1.1310	1.2556	1.1737	1.1336
0.5480	0.7594	0.7258	0.7481	0.7617	1.3284	1.3963	1.3524	1.3171
0.6741	0.8320	0.7941	0.8258	0.8360	1.5104	1.5059	1.5136	1.4838
0.8339	0.9152	0.8842	0.9138	0.9192	1.7218	1.6227	1.7169	1.6961
1.0000	1.0000	1.0000	1.0000	1.0000	1.9240	1.9240	1.9240	1.9240
$\overline{\Delta y}$		0.0229	0.0127	0.0021	%AAD	10.121	3.531	1.033

Table 4.24 (Continued)

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=312.65K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.6930	0.6930	0.6930	0.6930
0.0840	0.2320	0.2466	0.2117	0.2150	0.8830	0.9773	0.9069	0.8621
0.1500	0.3540	0.3696	0.3340	0.3385	1.0010	1.1346	1.0319	0.9825
0.3270	0.5760	0.5682	0.5580	0.5630	1.3220	1.4850	1.3538	1.2921
0.4300	0.6700	0.6442	0.6499	0.6546	1.4990	1.6510	1.5336	1.4649
0.5200	0.7400	0.7008	0.7177	0.7217	1.6540	1.7797	1.6881	1.6129
0.5810	0.7820	0.7365	0.7590	0.7627	1.7500	1.8599	1.7917	1.7124
0.7730	0.8970	-	-	-	2.0820	-	-	-
0.8690	0.9430	-	-	-	2.2330	-	-	-
1.0000	1.0000	1.0000	1.0000	1.0000	2.4370	2.4370	2.4370	2.4370
$\overline{\Delta y}$		0.0247	0.0206	0.0164	%AAD	10.063	2.491	2.231

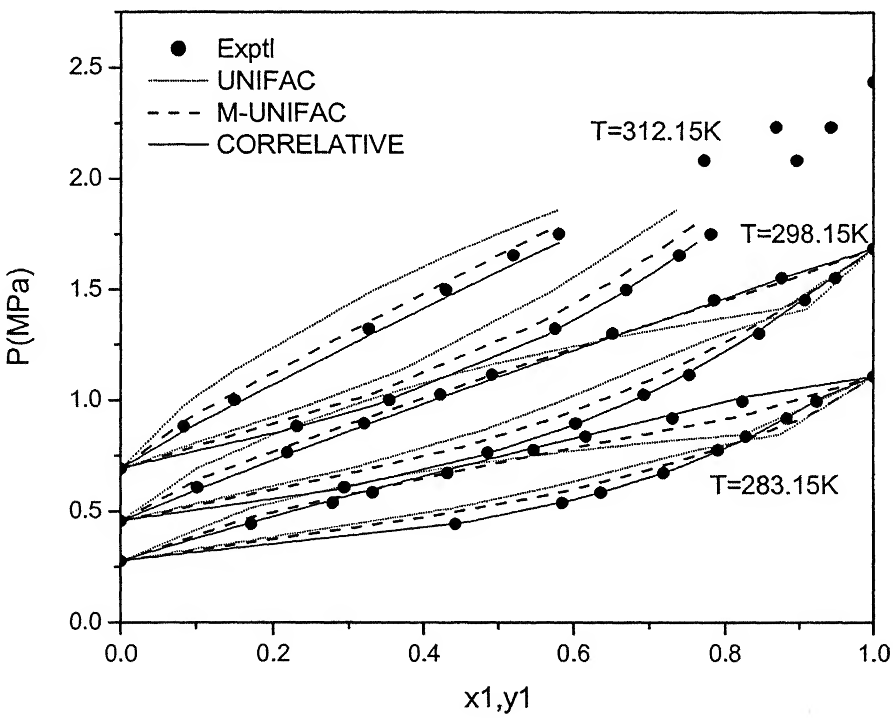

Figure 4.22 P-x-y diagram for R32 (1)/R227ea (2) system using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

Table 4.25 Results of VLE Calculations for R32 (1) / R227ea (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=283.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.2775	0.2775	0.2775	0.2775
0.1714	0.4424	0.5560	0.5105	0.4673	0.4418	0.5369	0.4800	0.4550
0.2790	0.5850	0.6582	0.6413	0.6020	0.5382	0.6534	0.6004	0.5547
0.3320	0.6363	0.6931	0.6880	0.6514	0.5844	0.7015	0.6570	0.6010
0.4320	0.7186	0.7462	0.7584	0.7277	0.6720	0.7817	0.7606	0.6856
0.5476	0.7905	0.7975	0.8224	0.7985	0.7750	0.8647	0.8787	0.7810
0.6159	0.8280	0.8259	0.8548	0.8349	0.8360	0.9114	0.9488	0.8373
0.7312	0.8832	0.8740	0.9037	0.8901	0.9194	0.9891	1.0700	0.9335
0.8240	0.9240	0.9146	0.9393	0.9306	0.9962	1.0518	1.1709	1.0129
1.0000	1.0000	1.0000	1.0000	1.0000	1.1092	1.1092	1.1092	1.1092
$\overline{\Delta y}$		0.0374	0.0388	0.0118	%AAD	14.130	13.323	1.881
T=298.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.4560	0.4560	0.4560	0.4560
0.1020	0.2940	0.3895	0.3335	0.2935	0.6070	0.6792	0.6115	0.6011
0.2190	0.4860	0.5620	0.5296	0.4854	0.7640	0.8971	0.8040	0.7582
0.3210	0.6030	0.6470	0.6375	0.5977	0.8960	1.0471	0.9616	0.8859
0.4230	0.6930	0.7094	0.7176	0.6838	1.0250	1.1761	1.1145	1.0086
0.4920	0.7530	0.7456	0.7626	0.7332	1.1140	1.2563	1.2174	1.0903
0.6520	0.8460	0.8227	0.8500	0.8307	1.3000	1.4318	1.4597	1.2806
0.7860	0.9080	0.8871	0.9124	0.9011	1.4530	1.5754	1.6728	1.4442
0.8770	0.9490	0.9331	-	0.9449	1.5520	1.6729	-	1.5592
1.0000	1.0000	1.0000	1.0000	1.0000	1.6860	1.6860	1.6860	1.6860
$\overline{\Delta y}$		0.0374	0.0229	0.0077	%AAD	12.506	8.388	1.143
T=303.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.5303	0.5303	0.5303	0.5303
0.1386	0.3428	0.4414	0.3923	0.3491	0.7354	0.8606	0.7687	0.7482
0.2308	0.4849	0.5578	0.5285	0.4843	0.8724	1.0420	0.9340	0.8826
0.3278	0.5901	0.6379	0.6293	0.5892	1.0104	1.2017	1.1004	1.0169
0.4113	0.6647	0.6909	0.6968	0.6615	1.1310	1.3227	1.2407	1.1289
0.5480	0.7594	0.7642	0.7855	0.7592	1.3284	1.5035	1.4702	1.3102
0.6741	0.8320	0.8268	0.8536	0.8354	1.5104	1.6619	1.6882	1.4794
0.8339	0.9152	-	-	0.9208	1.7218	-	-	1.7015
1.0000	1.0000	1.0000	1.0000	1.0000	1.9240	1.9240	1.9240	1.9240
$\overline{\Delta y}$		0.0426	0.0353	0.0029	%AAD	15.926	8.776	1.192

Table 4.25 (Continued)

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=312.65K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.6930	0.6930	0.6930	0.6930
0.0840	0.2320	0.3015	0.2533	0.2184	0.8830	0.9394	0.8552	0.8652
0.1500	0.3540	0.4267	0.3830	0.3399	1.0010	1.1230	1.0027	0.9853
0.3270	0.5760	0.6095	0.6005	0.5596	1.3220	1.5157	1.3770	1.2874
0.4300	0.6700	0.6780	0.6855	0.6508	1.4990	1.7053	1.5891	1.4561
0.5200	0.7400	-	0.7477	0.7189	1.6540	-	1.7759	1.6029
0.5810	0.7820	-	-	0.7609	1.7500	-	-	1.7030
0.7730	0.8970	-	-	-	2.0820	-	-	-
0.8690	0.9430	-	-	-	2.2330	-	-	-
1.0000	1.0000	1.0000	1.0000	1.0000	2.4370	2.4370	2.4370	2.4370
$\overline{\Delta y}$		0.0459	0.0196	0.0176	%AAD	11.748	4.173	2.475

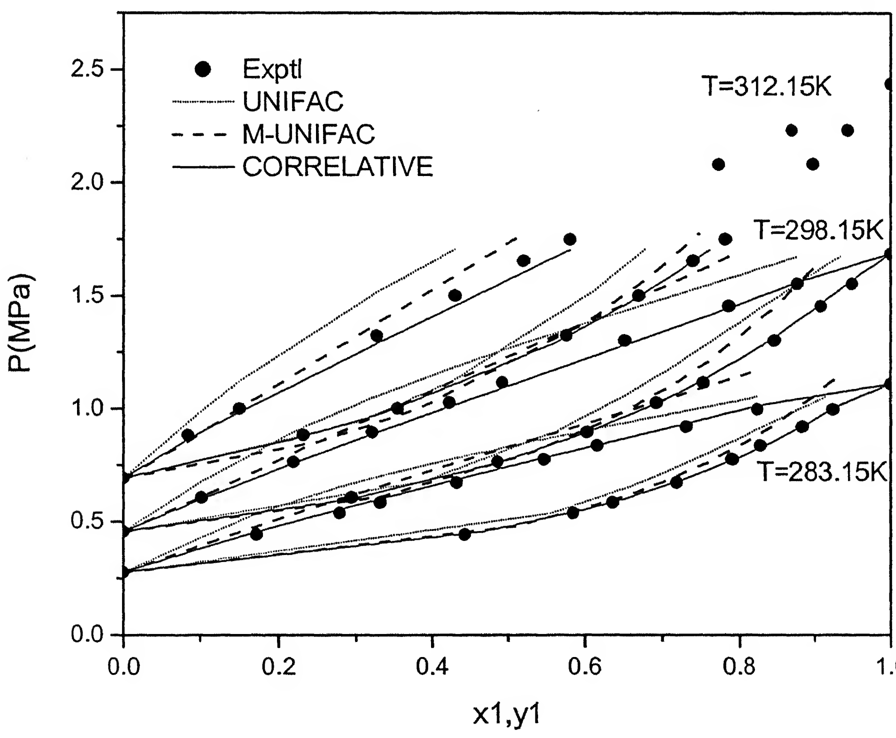

Figure 4.23 P-x-y diagram for R32 (1) / R227ea (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

Table 4.26 Results of VLE Calculations for R32 (1) / R227ea (2) System using Pure components as ref. fluids

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=283.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.2775	0.2775	0.2775	0.2775
0.1714	0.4424	0.5548	0.4835	0.4692	0.4418	0.5395	0.4667	0.4559
0.2790	0.5850	0.6558	0.6279	0.6028	0.5382	0.6544	0.5877	0.5554
0.3320	0.6363	0.6904	0.6806	0.6520	0.5844	0.7015	0.6477	0.6016
0.4320	0.7186	0.7432	0.7600	0.7279	0.6720	0.7802	0.7626	0.6860
0.5476	0.7905	0.7946	0.8303	0.7984	0.7750	0.8614	0.8994	0.7812
0.6159	0.8280	0.8233	0.8645	0.8348	0.8360	0.9072	0.9829	0.8373
0.7312	0.8832	0.8719	0.9138	0.8900	0.9194	0.9831	1.1295	0.9333
0.8240	0.9240	0.9130	-	0.9305	0.9962	1.0442	-	1.0125
1.0000	1.0000	1.0000	1.0000	1.0000	1.1092	1.1092	1.1092	1.1092
$\overline{\Delta y}$		0.0366	0.0395	0.0122	%AAD	13.906	13.659	1.938
T=298.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.4560	0.4560	0.4560	0.4560
0.1020	0.2940	0.3861	0.3042	0.2939	0.6070	0.6847	0.6047	0.6014
0.2190	0.4860	0.5575	0.5091	0.4854	0.7640	0.9002	0.7879	0.7584
0.3210	0.6030	0.6427	0.6286	0.5974	0.8960	1.0483	0.9503	0.8858
0.4230	0.6930	-	0.7180	0.6836	1.0250	-	1.1173	1.0084
0.4920	0.7530	-	-	0.7330	1.1140	-	-	1.0901
1.0000	1.0000	1.0000	1.0000	1.0000	1.6860	1.6860	1.6860	1.6860
$\overline{\Delta y}$		0.0677	0.0210	0.0071	%AAD	15.875	4.644	1.310
T=303.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.5303	0.5303	0.5303	0.5303
0.1386	0.3428	0.4368	0.3653	0.3491	0.7354	0.8662	0.7569	0.7484
0.2308	0.4849	0.5529	0.5100	0.4841	0.8724	1.0456	0.9170	0.8825
0.3278	0.5901	-	0.6212	0.5889	1.0104	-	1.0890	1.0165
1.0000	1.0000	1.0000	1.0000	1.0000	1.9240	1.9240	1.9240	1.9240
$\overline{\Delta y}$		0.0810	0.0262	0.0028	%AAD	18.820	5.275	1.177

Table 4.27 Results of VLE Calculations for R32 (1) / R236ea (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=288.55K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.1455	0.1455	0.1455	0.1455
0.0544	0.2690	0.1807	0.2188	0.2691	0.1929	0.2462	0.2568	0.1940
0.1026	0.4246	0.3076	0.3566	0.4268	0.2368	0.2791	0.2999	0.2377
0.1720	0.5749	0.4508	0.4994	0.5803	0.3020	0.3287	0.3625	0.3046
0.2515	0.6888	0.5744	0.6136	0.6952	0.3799	0.3884	0.4341	0.3863
0.3740	0.7964	0.7097	0.7321	0.8052	0.5085	0.4855	0.5435	0.5202
0.4678	0.8520	0.7842	0.7957	0.8596	0.6125	0.5632	0.6259	0.6280
0.4734	0.8541	0.7880	0.7990	0.8622	0.6187	0.5679	0.6308	0.6345
0.6213	0.9155	0.8723	0.8723	0.9192	0.7933	0.6948	0.7587	0.8114
0.7562	0.9506	0.9281	0.9238	0.9548	0.9625	0.8144	0.8750	0.9783
0.9000	0.9829	0.9738	0.9703	0.9834	1.1517	0.9454	1.0017	1.1626
1.0000	1.0000	1.0000	1.0000	1.0000	1.2942	1.2942	1.2942	1.2942
$\overline{\Delta y}$		0.0739	0.0527	0.0047	%AAD	12.307	13.156	1.573
T=303.19K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.2452	0.2452	0.2452	0.2452
0.0994	0.3789	0.2933	0.3383	0.3828	0.3713	0.4335	0.4609	0.3723
0.2546	0.6544	0.5673	0.6038	0.6620	0.5853	0.6113	0.6765	0.5940
0.4018	0.7856	0.7220	0.7400	0.7940	0.8064	0.7946	0.8807	0.8251
0.5155	0.8506	0.8041	0.8114	0.8578	0.9887	0.9439	1.0376	1.0140
0.6306	0.9006	0.8674	0.8672	0.9045	1.1902	1.1013	1.1961	1.2130
0.7603	0.9427	0.9229	0.9189	0.9443	1.4317	1.2853	1.3771	1.4469
0.9140	0.9814	0.9751	0.9720	0.9817	1.7410	1.5138	1.6010	1.7405
1.0000	1.0000	1.0000	1.0000	1.0000	1.9277	1.9277	1.9277	1.9277
$\overline{\Delta y}$		0.0489	0.0347	0.0047	%AAD	8.276	9.456	1.379
T=318.25K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.3953	0.3953	0.3953	0.3953
0.1437	0.4411	0.3756	0.4185	0.4480	0.6520	0.7249	0.7766	0.6527
0.2881	0.6507	0.5921	0.6223	0.6604	0.9296	0.9771	1.0728	0.9445
0.4168	0.7639	0.7173	0.7330	0.7709	1.2039	1.2191	1.3389	1.2254
0.5292	0.8341	0.7971	0.8029	0.8371	1.4623	1.4425	1.5729	1.4842
0.6337	0.8833	0.8555	0.8551	0.8841	1.7198	1.6598	1.7935	1.7361
0.7515	0.9271	0.9095	0.9056	0.9268	2.0308	1.9172	2.0498	2.0354
0.8751	0.9653	0.9572	-	-	2.3900	2.2033	-	-
0.8776	0.9659	-	-	-	2.3948	-	-	-
1.0000	1.0000	1.0000	1.0000	1.0000	2.7959	2.7959	2.7959	2.7959
$\overline{\Delta y}$		0.0373	0.0272	0.0046	%AAD	5.116	9.750	1.027

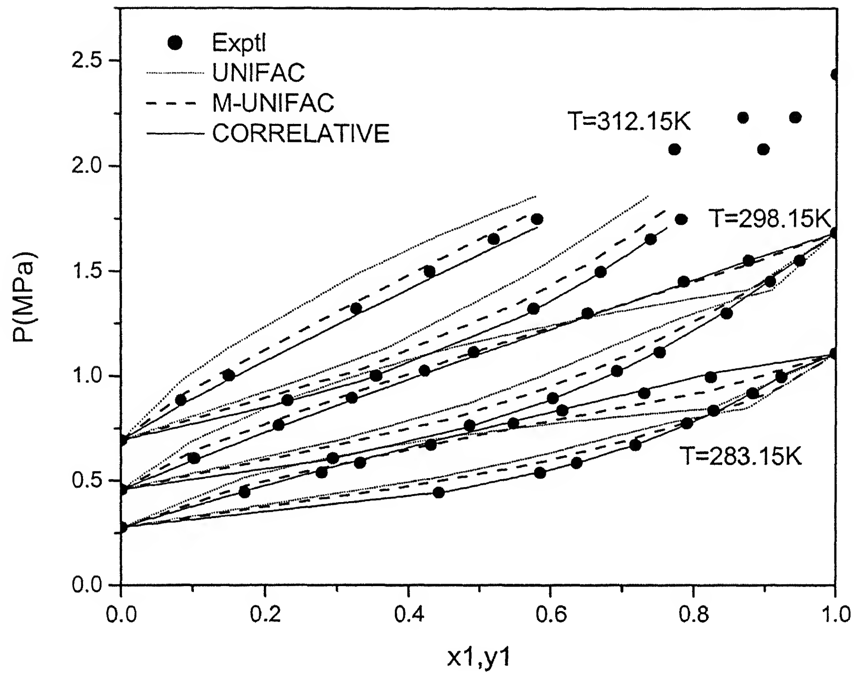

Figure 4.24 P-x-y diagram for R32 (1) / R227ea (2) System using pure components as ref. fluids

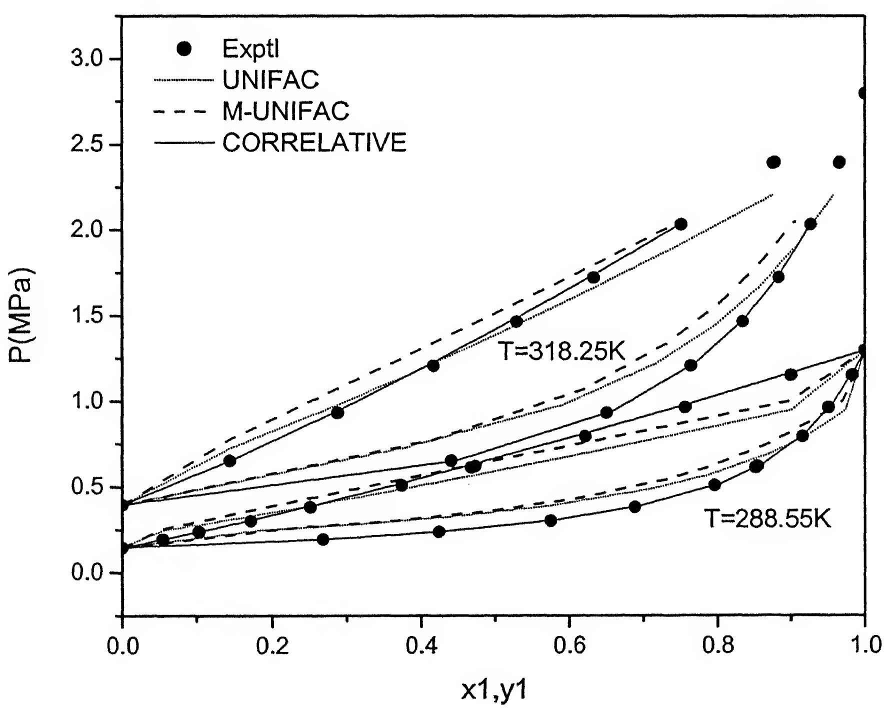

Figure 4.25 P-x-y diagram for R32 (1)/R236ea (2) system using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

Table 4.28 Results of VLE Calculations for R32 (1) / R236ea (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

x_1	y_1				P (MPa)			
Exptl	Exptl	Calculated			Exptl	Calculated		
		UNIFAC	M-UNIFAC	CORRELATIVE		UNIFAC	M-UNIFAC	CORRELATIVE
T=288.55K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.1455	0.1455	0.1455	0.1455
0.0544	0.2690	0.2801	0.3391	0.2788	0.1929	0.1955	0.2112	0.1954
0.1026	0.4246	0.4373	0.4991	0.4357	0.2368	0.2407	0.2697	0.2403
0.1720	0.5749	0.5869	0.6365	0.5852	0.3020	0.3085	0.3528	0.3076
0.2515	0.6888	0.6977	0.7315	0.6963	0.3799	0.3896	0.4466	0.3882
0.3740	0.7964	0.8049	0.8204	0.8037	0.5085	0.5219	0.5901	0.5192
0.4678	0.8520	0.8586	0.8654	0.8576	0.6125	0.6284	0.7003	0.6246
0.4734	0.8541	0.8612	0.8677	0.8603	0.6187	0.6348	0.7068	0.6312
0.6213	0.9155	0.9185	0.9178	0.9179	0.7933	0.8116	0.8840	0.8063
0.7562	0.9506	0.9547	0.9519	0.9544	0.9625	0.9812	1.0524	0.9743
0.9000	0.9829	0.9836	0.9817	0.9835	1.1517	1.1706	1.2429	1.1619
1.0000	1.0000	1.0000	1.0000	1.0000	1.2942	1.2942	1.2942	1.2942
$\overline{\Delta y}$		0.0075	0.0305	0.0065	%AAD	2.143	13.112	1.666
T=303.19K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.2452	0.2452	0.2452	0.2452
0.0994	0.3789	0.3856	0.4430	0.3841	0.3713	0.3743	0.4101	0.3737
0.2546	0.6544	0.6605	0.6945	0.6591	0.5853	0.5940	0.6704	0.5917
0.4018	0.7856	0.7918	0.8056	0.7907	0.8064	0.8223	0.9174	0.8178
0.5155	0.8506	0.8564	0.8608	0.8556	0.9887	1.0112	1.1118	1.0048
0.6306	0.9006	0.9041	0.9032	0.9035	1.1902	1.2133	1.3151	1.2049
0.7603	0.9427	0.9447	0.9417	0.9444	1.4317	1.4540	1.5562	1.4435
0.9140	0.9814	0.9821	0.9802	0.9820	1.7410	1.7597	1.8656	1.7458
1.0000	1.0000	1.0000	1.0000	1.0000	1.9277	1.9277	1.9277	1.9277
$\overline{\Delta y}$		0.0044	0.0199	0.0036	%AAD	1.588	11.077	1.016
T=318.25K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.3953	0.3953	0.3953	0.3953
0.1437	0.4411	0.4442	0.4943	0.4426	0.6520	0.6515	0.7127	0.6505
0.2881	0.6507	0.6560	0.6850	0.6546	0.9296	0.9380	1.0426	0.9350
0.4168	0.7639	0.7680	0.7810	0.7669	1.2039	1.2168	1.3421	1.2114
0.5292	0.8341	0.8360	0.8399	0.8351	1.4623	1.4788	1.6125	1.4708
0.6337	0.8833	0.8842	0.8833	0.8836	1.7198	1.7379	1.8752	1.7274
0.7515	0.9271	0.9277	-	0.9274	2.0308	2.0501	-	2.0368
1.0000	1.0000	1.0000	1.0000	1.0000	2.7959	2.7959	2.7959	2.7959
$\overline{\Delta y}$		0.0027	0.0221	0.0017	%AAD	0.862	10.449	0.457

Table 4.29 Results of VLE Calculations for R32 (1) / R236ea (2) System using Pure components as ref. fluids

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=288.55K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.1455	0.1455	0.1455	0.1455
0.0544	0.2690	0.2783	0.3354	0.2783	0.1929	0.1948	0.2100	0.1953
0.1026	0.4246	0.4352	0.4954	0.4352	0.2368	0.2395	0.2676	0.2402
0.1720	0.5749	0.5849	0.6336	0.5848	0.3020	0.3066	0.3496	0.3073
0.2515	0.6888	0.6964	0.7296	0.6960	0.3799	0.3871	0.4426	0.3878
0.3740	0.7964	0.8040	0.8196	0.8036	0.5085	0.5183	0.5854	0.5190
0.4678	0.8520	0.8580	0.8650	0.8577	0.6125	0.6240	0.6954	0.6247
0.4734	0.8541	0.8607	0.8674	0.8604	0.6187	0.6304	0.7020	0.6311
0.6213	0.9155	0.9183	0.9178	0.9181	0.7933	0.8063	0.8790	0.8066
0.7562	0.9506	0.9547	0.9521	0.9545	0.9625	0.9751	1.0473	0.9752
0.9000	0.9829	0.9836	-	0.9836	1.1517	1.1634	-	1.1633
1.0000	1.0000	1.0000	1.0000	1.0000	1.2942	1.2942	1.2942	1.2942
$\overline{\Delta y}$		0.0065	0.0322	0.0063	%AAD	1.521	12.877	1.658
T=303.19K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.2452	0.2452	0.2452	0.2452
0.0994	0.3789	0.3854	0.4406	0.3833	0.3713	0.3712	0.4059	0.3736
0.2546	0.6544	0.6606	0.6935	0.6585	0.5853	0.5890	0.6632	0.5912
0.4018	0.7856	0.7920	0.8053	0.7905	0.8064	0.8154	0.9081	0.8173
0.5155	0.8506	0.8567	-	0.8556	0.9887	1.0030	-	1.0045
0.6306	0.9006	0.9044	-	0.9035	1.1902	1.2036	-	1.2047
1.0000	1.0000	1.0000	1.0000	1.0000	1.9277	1.9277	1.9277	1.9277
$\overline{\Delta y}$		0.0058	0.0402	0.0043	%AAD	0.8670	11.747	1.158
T=318.25K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.3953	0.3953	0.3953	0.3953
0.1437	0.4411	0.4453	0.4930	0.4415	0.6520	0.6455	0.7059	0.6509
0.2881	0.6507	0.6573	0.6846	0.6538	0.9296	0.9304	1.0328	0.9348
0.4168	0.7639	0.7691	0.7812	0.7664	1.2039	1.2076	1.3305	1.2109
1.0000	1.0000	1.0000	1.0000	1.0000	2.7959	2.7959	2.7959	2.7959
$\overline{\Delta y}$		0.0053	0.0343	0.0020	%AAD	0.460	9.957	0.436

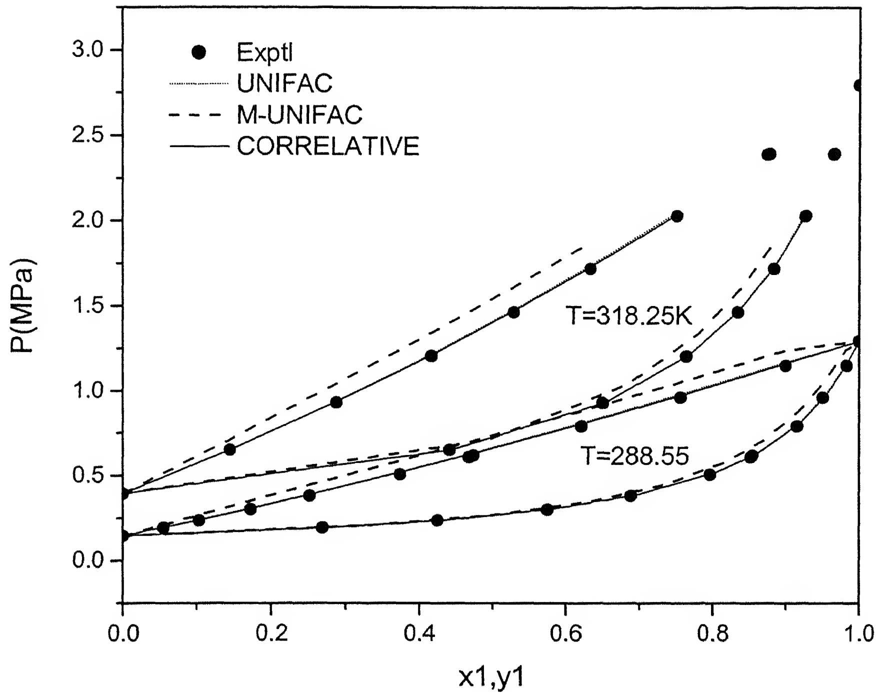

Figure 4.26 P-x-y diagram for R32 (1) / R236ea (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

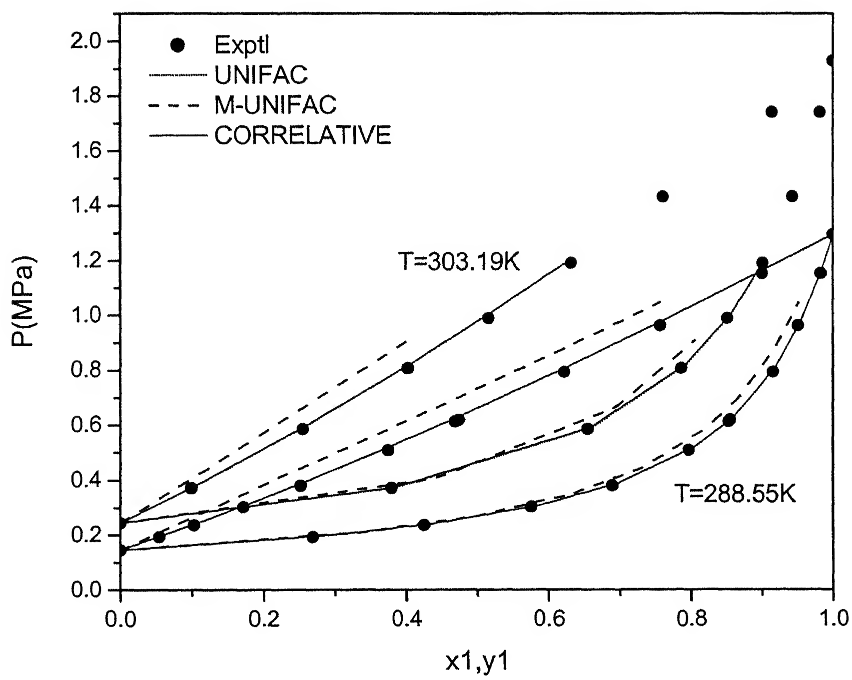

Figure 4.27 P-x-y diagram for R32 (1) / R236ea (2) System using pure components as ref. fluids

Table 4.30 Results of VLE Calculations for R32 (1) / R290 (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=248.13K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.2034	0.2034	0.2034	0.2034
0.1577	0.5375	0.2689	0.4047	0.4967	0.4130	0.2414	0.2878	0.3848
0.4204	0.6158	0.4798	0.5443	0.6303	0.4628	0.2673	0.3297	0.4645
0.5850	0.6301	0.5581	0.5554	0.6397	0.4658	0.2689	0.3309	0.4679
0.5892	0.6308	0.5599	0.5554	0.6397	0.4659	0.2689	0.3309	0.4679
0.6419	0.6359	0.5838	0.5560	0.6402	0.4661	0.2677	0.3309	0.4679
0.6421	0.6362	0.5839	0.5560	0.6401	0.4661	0.2677	0.3308	0.4679
0.6707	0.6386	0.5973	0.5565	0.6408	0.4659	0.2666	0.3308	0.4679
0.6732	0.6394	0.5986	0.5568	0.6409	0.4661	0.2665	0.3307	0.4679
0.6911	0.6430	0.6074	0.5573	0.6416	0.4659	0.2657	0.3306	0.4678
0.7061	0.6437	0.6153	0.5581	0.6424	0.4657	0.2649	0.3305	0.4677
0.8510	0.6866	0.7178	0.5973	0.6792	0.4536	0.2497	0.3180	0.4561
0.9248	0.7583	0.8140	0.6828	0.7552	0.4248	0.2325	0.2879	0.4246
1.0000	1.0000	1.0000	1.0000	1.0000	0.3342	0.3342	0.3342	0.3342
$\overline{\Delta y}$		0.0738	0.0846	0.0083	%AAD	42.951	29.441	0.920
T=254.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.2533	0.2533	0.2533	0.2533
0.0377	0.2676	0.0837	0.1573	0.2082	0.3432	0.2690	0.2812	0.3282
0.0589	0.3594	0.1248	0.2221	0.2866	0.3908	0.2763	0.2999	0.3596
0.0993	0.4522	0.1935	0.3153	0.3927	0.4486	0.2889	0.3308	0.4117
0.1589	0.5227	0.2760	0.4067	0.4893	0.5015	0.3048	0.3658	0.4713
0.2358	0.5705	0.3587	0.4783	0.5601	0.5393	0.3205	0.3956	0.5228
0.2872	0.5872	0.4028	0.5090	0.5890	0.5527	0.3284	0.4080	0.5448
0.3763	0.6064	0.4652	0.5421	0.6193	0.5648	0.3379	0.4199	0.5664
0.5354	0.6287	0.5497	0.5666	0.6403	0.5743	0.3448	0.4251	0.5772
0.5668	0.6329	0.5644	0.5686	0.6421	0.5751	0.3449	0.4251	0.5777
0.6407	0.6410	0.5991	0.5728	0.6455	0.5752	0.3437	0.4249	0.5781
0.7184	0.6539	0.6392	0.5795	0.6519	0.5746	0.3399	0.4235	0.5774
0.7485	0.6602	0.6569	0.5843	0.6563	0.5735	0.3375	0.4221	0.5764
0.8616	0.7084	0.7468	0.6318	0.7002	0.5556	0.3210	0.4036	0.5590
0.8921	0.7348	0.7820	0.6614	0.7269	0.5434	0.3135	0.3909	0.5461
0.9562	0.8394	0.8867	0.7869	0.8346	0.4934	0.2908	0.3405	0.4930
1.0000	1.0000	1.0000	1.0000	1.0000	0.4212	0.4212	0.4212	0.4212
$\overline{\Delta y}$		0.1201	0.0855	0.0202	%AAD	38.329	26.030	2.334
T=273.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.4735	0.4735	0.4735	0.4735
0.0265	0.1931	0.0629	0.1121	0.1389	0.5870	0.5015	0.5235	0.5606
0.0836	0.3764	0.1753	0.2754	0.3257	0.7459	0.5435	0.6201	0.6971
0.1562	0.4800	0.2847	0.3985	0.4551	0.8701	0.5884	0.7130	0.8290
0.2399	0.5423	0.3793	0.4819	0.5373	0.9513	0.6290	0.7849	0.9315
0.4087	0.6014	0.5110	0.5653	0.6145	1.0240	0.6801	0.8520	1.0286

Table 4.30 (Continued)

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=273.15K								
0.5166	0.6285	0.5736	0.5923	0.6382	1.0433	0.6961	0.8651	1.0494
0.6343	0.6548	0.6359	0.6145	0.6576	1.0524	0.7022	0.8678	1.0570
0.6467	0.6575	0.6426	0.6169	0.6597	1.0525	0.7022	0.8675	1.0572
0.6580	0.6603	0.6488	0.6191	0.6616	1.0527	0.7020	0.8672	1.0573
0.6817	0.6669	0.6620	0.6241	0.6662	1.0525	0.7014	0.8662	1.0572
0.7061	0.6735	0.6761	0.6300	0.6714	1.0516	0.7001	0.8645	1.0564
0.7401	0.6844	0.6968	0.6394	0.6801	1.0490	0.6973	0.8609	1.0541
0.7912	0.7050	0.7317	0.6588	0.6979	1.0414	0.6903	0.8512	1.0462
0.9102	0.7969	0.8458	0.7576	0.7887	0.9764	0.6545	0.7826	0.9791
0.9702	0.9068	0.9379	0.8847	0.9016	0.8860	0.6196	0.6933	0.8862
1.0000	1.0000	1.0000	1.0000	1.0000	0.8131	0.8131	0.8131	0.8131
$\overline{\Delta y}$		0.0671	0.0505	0.0128	%AAD	31.452	17.543	1.490
T=294.91K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.8748	0.8748	0.8748	0.8748
0.0414	0.2035	0.0949	0.1490	0.1704	1.1058	0.9606	1.0444	1.0629
0.1696	0.4417	0.3044	0.3960	0.4306	1.5174	1.1360	1.3877	1.4780
0.3309	0.5527	0.4677	0.5295	0.5589	1.7563	1.2882	1.6228	1.7589
0.3997	0.5816	0.5196	0.5634	0.5900	1.8125	1.3331	1.6768	1.8230
0.4589	0.6045	0.5594	0.5872	0.6115	1.8459	1.3637	1.7086	1.8611
0.4849	0.6134	0.5759	0.5967	0.6201	1.8588	1.3749	1.7191	1.8741
0.5482	0.6354	0.6144	0.6180	0.6393	1.8836	1.3972	1.7376	1.8976
0.6391	0.6668	0.6682	0.6478	0.6663	1.9023	1.4172	1.7488	1.9153
0.7329	0.7046	0.7267	0.6834	0.6991	1.9008	1.4223	1.7407	1.9131
0.7399	0.7082	0.7314	0.6865	0.7020	1.9003	1.4220	1.7390	1.9118
0.7535	0.7145	0.7407	0.6928	0.7079	1.8973	1.4211	1.7352	1.9088
0.8267	0.7573	0.7956	0.7353	0.7479	1.8661	1.4082	1.6990	1.8763
0.9097	0.8331	0.8747	0.8151	0.8239	1.7792	1.3720	1.6042	1.7819
0.9446	0.8809	0.9167	0.8682	0.8746	1.7131	1.3474	1.5352	1.7105
0.9604	0.9080	0.9380	0.8985	0.9035	1.6748	1.3338	1.4959	1.6694
0.9785	0.9447	0.9647	0.9396	0.9426	1.6228	1.3163	1.4435	1.6143
1.0000	1.0000	1.0000	1.0000	1.0000	1.5456	1.5456	1.5456	1.5456
$\overline{\Delta y}$		0.0459	0.0215	0.0079	%AAD	23.645	8.520	0.864
T=293.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.8362	0.8362	0.8362	0.8362
0.4601	0.6067	0.5594	0.5878	0.6135	1.7682	1.2960	1.6236	1.7822
0.6387	0.6664	0.6662	0.6456	0.6658	1.8197	1.3441	1.6590	1.8313
0.7557	0.7136	0.7399	0.6904	0.7072	1.8127	1.3464	1.6449	1.8244
0.8260	0.7537	0.7927	0.7307	0.7450	1.7853	1.3336	1.6115	1.7943
1.0000	1.0000	1.0000	1.0000	1.0000	1.4722	1.4722	1.4722	1.4722
$\overline{\Delta y}$		0.0282	0.0215	0.0056	%AAD	25.965	9.001	0.644

Table 4.31 Results of VLE Calculations for R32 (1) / R290 (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=248.13K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.2034	0.2034	0.2034	0.2034
0.1577	0.5375	0.3833	0.5476	0.5243	0.4130	0.2850	0.3774	0.4030
0.4204	0.6158	0.5864	0.6443	0.6201	0.4628	0.3459	0.4406	0.4645
0.5850	0.6301	0.6595	0.6533	0.6274	0.4658	0.3603	0.4436	0.4666
0.5892	0.6308	0.6613	0.6535	0.6276	0.4659	0.3606	0.4436	0.4666
0.6419	0.6359	0.6847	0.6571	0.6305	0.4661	0.3629	0.4439	0.4667
0.6421	0.6362	0.6849	0.6571	0.6306	0.4661	0.3629	0.4439	0.4667
0.6707	0.6386	0.6982	0.6600	0.6330	0.4659	0.3638	0.4439	0.4666
0.6732	0.6394	0.6994	0.6603	0.6332	0.4661	0.3639	0.4439	0.4665
0.6911	0.6430	0.7081	0.6627	0.6355	0.4659	0.3642	0.4438	0.4663
0.7061	0.6437	0.7157	0.6651	0.6375	0.4657	0.3644	0.4436	0.4660
0.8510	0.6866	0.8099	0.7203	0.6928	0.4536	0.3597	0.4309	0.4498
0.9248	0.7583	0.8846	0.8009	0.7776	0.4248	0.3501	0.4045	0.4175
1.0000	1.0000	1.0000	1.0000	1.0000	0.3342	0.3342	0.3342	0.3342
$\overline{\Delta y}$		0.0706	0.0239	0.0071	%AAD	22.627	5.105	0.525
T=254.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.2533	0.2533	0.2533	0.2533
0.0377	0.2676	0.1366	0.2641	0.2478	0.3432	0.2804	0.3142	0.3386
0.0589	0.3594	0.1957	0.3485	0.3293	0.3908	0.2961	0.3511	0.3756
0.0993	0.4522	0.2848	0.4516	0.4303	0.4486	0.3228	0.4083	0.4328
0.1589	0.5227	0.3792	0.5357	0.5137	0.5015	0.3549	0.4676	0.4917
0.2358	0.5705	0.4631	0.5913	0.5694	0.5393	0.3865	0.5130	0.5361
0.2872	0.5872	0.5050	0.6127	0.5906	0.5527	0.4027	0.5306	0.5530
0.3763	0.6064	0.5620	0.6340	0.6116	0.5648	0.4239	0.5467	0.5680
0.5354	0.6287	0.6398	0.6513	0.6276	0.5743	0.4468	0.5557	0.5755
0.5668	0.6329	0.6539	0.6538	0.6298	0.5751	0.4497	0.5564	0.5760
0.6407	0.6410	0.6877	0.6612	0.6363	0.5752	0.4548	0.5575	0.5764
0.7184	0.6539	0.7270	0.6744	0.6487	0.5746	0.4573	0.5569	0.5750
0.7485	0.6602	0.7441	0.6823	0.6563	0.5735	0.4574	0.5557	0.5733
0.8616	0.7084	0.8248	0.7401	0.7149	0.5556	0.4514	0.5381	0.5515
0.8921	0.7348	0.8535	0.7692	0.7454	0.5434	0.4474	0.5268	0.5379
0.9562	0.8394	0.9297	0.8706	0.8545	0.4934	0.4341	0.4854	0.4884
1.0000	1.0000	1.0000	1.0000	1.0000	0.4212	0.4212	0.4212	0.4212
$\overline{\Delta y}$		0.0934	0.0204	0.0094	%AAD	22.282	4.666	1.024
T=273.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.4735	0.4735	0.4735	0.4735
0.0265	0.1931	0.0912	0.1713	0.1622	0.5870	0.5099	0.5508	0.5690
0.0836	0.3764	0.2348	0.3700	0.3546	0.7459	0.5826	0.7101	0.7232
0.1562	0.4800	0.3559	0.4894	0.4724	0.8701	0.6567	0.8486	0.8561
0.2399	0.5423	0.4502	0.5589	0.5415	0.9513	0.7219	0.9459	0.9482
0.4087	0.6014	0.5730	0.6225	0.6045	1.0240	0.8073	1.0324	1.0272

Table 4.31 (Continued)

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=273.15K								
0.5166	0.6285	0.6316	0.6453	0.6266	1.0433	0.8406	1.0535	1.0450
0.6343	0.6548	0.6921	0.6695	0.6497	1.0524	0.8638	1.0642	1.0525
0.6467	0.6575	0.6986	0.6725	0.6526	1.0525	0.8655	1.0647	1.0527
0.6580	0.6603	0.7047	0.6753	0.6553	1.0527	0.8670	1.0651	1.0527
0.6817	0.6669	0.7177	0.6816	0.6615	1.0525	0.8697	1.0654	1.0523
0.7061	0.6735	0.7315	0.6890	0.6686	1.0516	0.8718	1.0650	1.0512
0.7401	0.6844	0.7517	0.7009	0.6804	1.0490	0.8738	1.0630	1.0480
0.7912	0.7050	0.7851	0.7239	0.7034	1.0414	0.8742	1.0553	1.0380
0.9102	0.7969	0.8855	0.8223	0.8054	0.9764	0.8589	0.9959	0.9688
0.9702	0.9068	0.9565	0.9230	0.9142	0.8860	0.8385	0.9230	0.8863
1.0000	1.0000	1.0000	1.0000	1.0000	0.8131	0.8131	0.8131	0.8131
$\overline{\Delta y}$		0.0672	0.0163	0.0075	%AAD	17.480	2.041	0.656
T=294.91K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.8748	0.8748	0.8748	0.8748
0.0414	0.2035	0.1189	0.1946	0.1883	1.1058	0.9792	1.0941	1.0795
0.1696	0.4417	0.3470	0.4504	0.4397	1.5174	1.2225	1.5520	1.5074
0.3309	0.5527	0.5041	0.5644	0.5529	1.7563	1.4250	1.8303	1.7606
0.3997	0.5816	0.5529	0.5930	0.5812	1.8125	1.4865	1.8944	1.8168
0.4589	0.6045	0.5907	0.6141	0.6017	1.8459	1.5304	1.9347	1.8509
0.4849	0.6134	0.6065	0.6228	0.6103	1.8588	1.5473	1.9491	1.8629
0.5482	0.6354	0.6439	0.6436	0.6304	1.8836	1.5833	1.9770	1.8853
0.6391	0.6668	0.6971	0.6751	0.6610	1.9023	1.6225	2.0016	1.9025
0.7329	0.7046	0.7555	0.7151	0.7000	1.9008	1.6475	2.0050	1.8988
0.7399	0.7082	0.7601	0.7185	0.7034	1.9003	1.6487	2.0041	1.8974
0.7535	0.7145	0.7693	0.7256	0.7105	1.8973	1.6507	2.0018	1.8940
0.8267	0.7573	0.8227	0.7714	0.7565	1.8661	1.6540	1.9729	1.8592
0.9097	0.8331	0.8956	0.8494	0.8371	1.7792	1.6393	1.8908	1.7685
0.9446	0.8809	0.9321	0.8962	0.8868	1.7131	1.6255	1.8322	1.7051
0.9604	0.9080	0.9500	0.9215	0.9140	1.6748	1.6174	1.7994	1.6697
0.9785	0.9447	0.9719	0.9543	0.9497	1.6228	1.6067	1.7564	1.6233
1.0000	1.0000	1.0000	1.0000	1.0000	1.5456	1.5456	1.5456	1.5456
$\overline{\Delta y}$		0.0451	0.0111	0.0044	%AAD	12.535	5.187	0.395
T=293.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.8362	0.8362	0.8362	0.8362
0.4601	0.6067	0.5926	0.6165	0.6036	1.7682	1.4617	1.8481	1.7728
0.6387	0.6664	0.6969	0.6749	0.6603	1.8197	1.5473	1.9088	1.8195
0.7557	0.7136	0.7703	0.7254	0.7098	1.8127	1.5738	1.9081	1.8104
0.8260	0.7537	0.8214	0.7690	0.7536	1.7853	1.5763	1.8812	1.7781
1.0000	1.0000	1.0000	1.0000	1.0000	1.4722	1.4722	1.4722	1.4722
$\overline{\Delta y}$		0.0423	0.0113	0.0033	%AAD	14.299	5.013	0.200

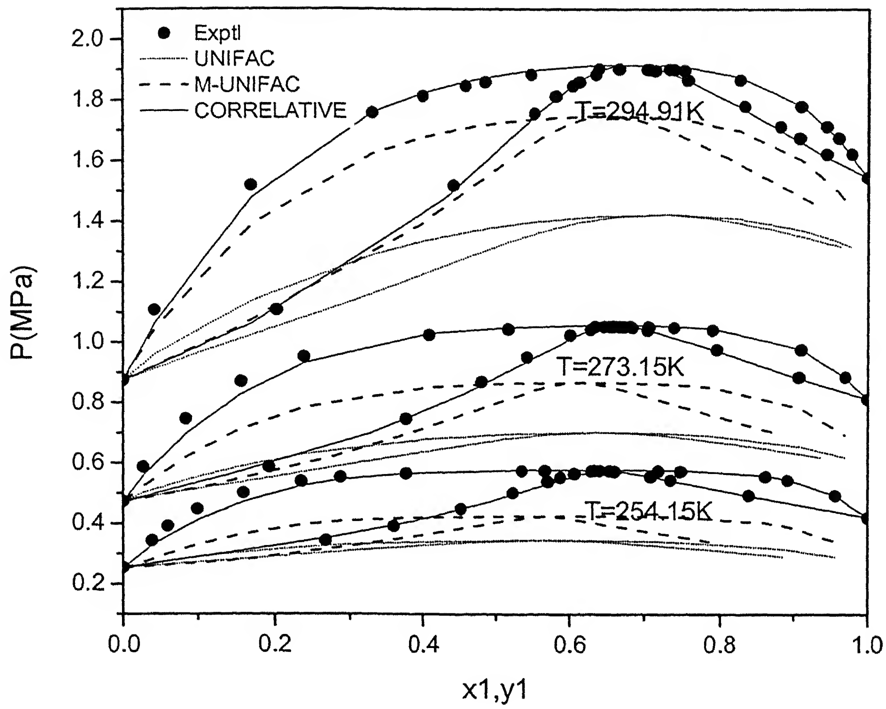

Figure 4.28 P-x-y diagram for R32 (1)/R290 (2) system using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

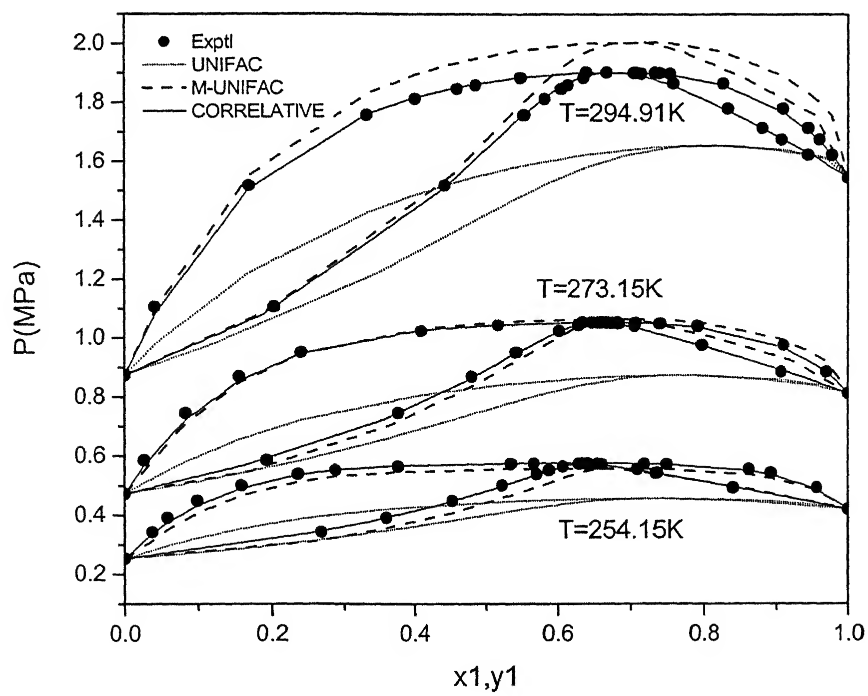

Figure 4.29 P-x-y diagram for R32 (1) / R290 (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

Table 4.32 Results of VLE Calculations for R32 (1) / R290 (2) System using Pure components as ref. fluids

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=248.13K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.2034	0.2034	0.2034	0.2034
0.1577	0.5375	0.3851	0.5503	0.5267	0.4130	0.2849	0.3784	0.4045
0.4204	0.6158	0.5865	0.6440	0.6197	0.4628	0.3455	0.4401	0.4645
0.5850	0.6301	0.6595	0.6530	0.6268	0.4658	0.3599	0.4430	0.4665
0.5892	0.6308	0.6613	0.6533	0.6270	0.4659	0.3602	0.4431	0.4666
0.6419	0.6359	0.6848	0.6570	0.6301	0.4661	0.3625	0.4434	0.4666
0.6421	0.6362	0.6849	0.6571	0.6301	0.4661	0.3626	0.4434	0.4666
0.6707	0.6386	0.6983	0.6602	0.6328	0.4659	0.3634	0.4434	0.4665
0.6732	0.6394	0.6995	0.6605	0.6331	0.4661	0.3635	0.4434	0.4665
0.6911	0.6430	0.7083	0.6629	0.6353	0.4659	0.3638	0.4432	0.4662
0.7061	0.6437	0.7160	0.6654	0.6375	0.4657	0.3640	0.4431	0.4659
0.8510	0.6866	0.8108	0.7222	0.6943	0.4536	0.3594	0.4302	0.4494
0.9248	0.7583	0.8854	0.8033	0.7799	0.4248	0.3500	0.4039	0.4171
1.0000	1.0000	1.0000	1.0000	1.0000	0.3342	0.3342	0.3342	0.3342
$\overline{\Delta y}$		0.0707	0.0244	0.0074	%AAD	22.695	5.199	0.501
T=254.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.2533	0.2533	0.2533	0.2533
0.0377	0.2676	0.1379	0.2673	0.2512	0.3432	0.2802	0.3148	0.3396
0.0589	0.3594	0.1971	0.3517	0.3327	0.3908	0.2960	0.3520	0.3770
0.0993	0.4522	0.2861	0.4542	0.4332	0.4486	0.3227	0.4093	0.4345
0.1589	0.5227	0.3802	0.5371	0.5155	0.5015	0.3549	0.4683	0.4932
0.2358	0.5705	0.4635	0.5917	0.5700	0.5393	0.3863	0.5129	0.5370
0.2872	0.5872	0.5049	0.6124	0.5907	0.5527	0.4023	0.5300	0.5535
0.3763	0.6064	0.5614	0.6332	0.6111	0.5648	0.4232	0.5457	0.5680
0.5354	0.6287	0.6390	0.6503	0.6267	0.5743	0.4459	0.5545	0.5753
0.5668	0.6329	0.6532	0.6528	0.6290	0.5751	0.4488	0.5552	0.5758
0.6407	0.6410	0.6872	0.6604	0.6357	0.5752	0.4538	0.5562	0.5763
0.7184	0.6539	0.7267	0.6741	0.6485	0.5746	0.4563	0.5556	0.5748
0.7485	0.6602	0.7438	0.6822	0.6564	0.5735	0.4564	0.5544	0.5730
0.8616	0.7084	0.8251	0.7410	0.7160	0.5556	0.4503	0.5366	0.5509
0.8921	0.7348	0.8538	0.7703	0.7467	0.5434	0.4464	0.5253	0.5373
0.9562	0.8394	0.9301	0.8718	0.8559	0.4934	0.4332	0.4842	0.4881
1.0000	1.0000	1.0000	1.0000	1.0000	0.4212	0.4212	0.4212	0.4212
$\overline{\Delta y}$		0.0930	0.0201	0.0090	%AAD	22.397	4.764	0.945
T=273.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.4735	0.4735	0.4735	0.4735
0.0265	0.1931	0.0911	0.1716	0.1635	0.5870	0.5109	0.5520	0.5699
0.0836	0.3764	0.2341	0.3696	0.3559	0.7459	0.5833	0.7110	0.7249
0.1562	0.4800	0.3546	0.4881	0.4729	0.8701	0.6568	0.8482	0.8576
0.2399	0.5423	0.4483	0.5569	0.5413	0.9513	0.7211	0.9439	0.9489
0.4087	0.6014	0.5707	0.6202	0.6039	1.0240	0.8051	1.0288	1.0272

Table 4.32 (Continued)

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=273.15K								
0.5166	0.6285	0.6294	0.6430	0.6259	1.0433	0.8377	1.0495	1.0448
0.6343	0.6548	0.6902	0.6674	0.6491	1.0524	0.8603	1.0600	1.0523
0.6467	0.6575	0.6968	0.6704	0.6520	1.0525	0.8620	1.0605	1.0524
0.6580	0.6603	0.7029	0.6732	0.6548	1.0527	0.8634	1.0608	1.0525
0.6817	0.6669	0.7159	0.6797	0.6610	1.0525	0.8659	1.0610	1.0520
0.7061	0.6735	0.7298	0.6871	0.6682	1.0516	0.8680	1.0606	1.0509
0.7401	0.6844	0.7502	0.6992	0.6800	1.0490	0.8698	1.0584	1.0476
0.7912	0.7050	0.7839	0.7224	0.7031	1.0414	0.8699	1.0505	1.0376
0.9102	0.7969	0.8849	0.8215	0.8056	0.9764	0.8540	0.9904	0.9682
0.9702	0.9068	0.9563	0.9228	0.9146	0.8860	0.8333	0.9174	0.8857
1.0000	1.0000	1.0000	1.0000	1.0000	0.8131	0.8131	0.8131	0.8131
$\overline{\Delta y}$		0.0667	0.0148	0.0076	%AAD	17.742	1.711	0.627

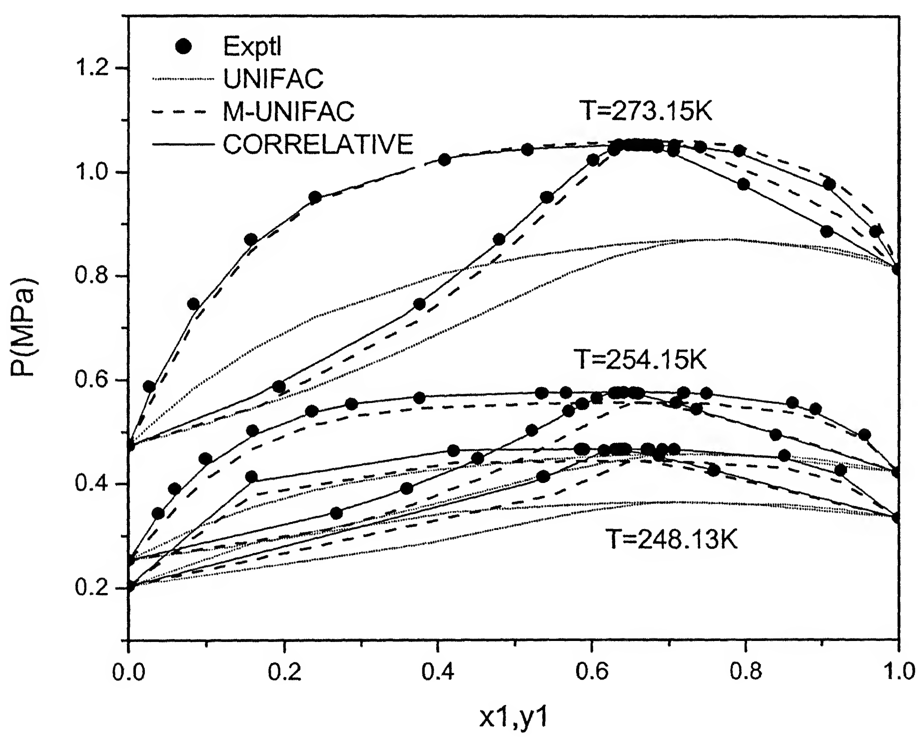

Figure 4.30 P-x-y diagram for R32 (1) / R290 (2) System using pure components as ref. fluids

Table 4.33 Results of VLE Calculations for R124 (1) / R142b (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=298.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.338	0.338	0.338	0.338
0.039	0.041	0.0556	0.0580	0.0417	0.339	0.330	0.333	0.339
0.050	0.053	0.0708	0.0736	0.0535	0.339	0.332	0.335	0.339
0.189	0.196	0.2437	0.2485	0.2019	0.343	0.352	0.357	0.343
0.240	0.263	0.3006	0.3048	0.2560	0.345	0.359	0.364	0.345
0.431	0.452	0.4926	0.4924	0.4559	0.351	0.380	0.386	0.352
0.540	0.566	0.5927	0.5896	0.5670	0.356	0.390	0.395	0.357
0.587	0.611	0.6346	0.6305	0.6140	0.359	0.394	0.399	0.359
0.684	0.703	0.7198	0.7141	0.7093	0.362	0.401	0.405	0.363
0.783	0.800	0.8061	0.8000	0.8038	0.369	0.408	0.410	0.368
0.947	0.949	0.9515	0.9489	0.9535	0.377	0.416	0.415	0.377
1.000	1.000	1.0000	1.0000	1.0000	0.379	0.379	0.379	0.379
$\overline{\Delta y}$		0.0234	0.0227	0.0037	%AAD	7.025	7.837	0.134
T=312.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.508	0.508	0.508	0.508
0.035	0.037	0.0481	0.0499	0.0373	0.510	0.499	0.502	0.511
0.124	0.134	0.1612	0.1650	0.1321	0.514	0.517	0.522	0.514
0.240	0.257	0.2929	0.2962	0.2550	0.520	0.539	0.546	0.520
0.329	0.346	0.3854	0.3870	0.3483	0.526	0.553	0.561	0.525
0.508	0.536	0.5566	0.5539	0.5325	0.536	0.578	0.585	0.535
0.664	0.692	0.6971	0.6916	0.6879	0.546	0.596	0.600	0.545
0.770	0.792	0.7912	0.7852	0.7899	0.553	0.605	0.607	0.553
0.791	0.817	0.8099	0.8039	0.8098	0.555	0.607	0.609	0.555
0.867	0.890	0.8779	0.8730	0.8805	0.561	0.612	0.612	0.560
1.000	1.000	1.0000	1.0000	1.0000	0.573	0.573	0.573	0.573
$\overline{\Delta y}$		0.0177	0.0199	0.0037	%AAD	6.287	6.930	0.106

Table 4.34 Results of VLE Calculations for R124 (1) / R142b (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=298.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.338	0.338	0.338	0.338
0.039	0.041	0.0496	0.0516	0.0417	0.339	0.341	0.344	0.339
0.050	0.053	0.0632	0.0657	0.0535	0.339	0.343	0.345	0.339
0.189	0.196	0.2229	0.2273	0.2020	0.343	0.356	0.360	0.343
0.240	0.263	0.2768	0.2809	0.2560	0.345	0.360	0.365	0.345
0.431	0.452	0.4643	0.4641	0.4558	0.351	0.372	0.378	0.352
0.540	0.566	0.5650	0.5620	0.5670	0.356	0.377	0.382	0.357
0.587	0.611	0.6078	0.6035	0.6140	0.359	0.379	0.384	0.359
0.684	0.703	0.6960	0.6900	0.7093	0.362	0.381	0.386	0.363
0.783	0.800	0.7872	0.7805	0.8039	0.369	0.383	0.386	0.368
0.947	0.949	0.9456	0.9425	0.9536	0.377	0.383	0.382	0.377
1.000	1.000	1.0000	1.0000	1.0000	0.379	0.379	0.379	0.379
$\overline{\Delta y}$		0.0099	0.0135	0.0037	%AAD	3.762	4.876	0.132
T=312.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.508	0.508	0.508	0.508
0.035	0.037	0.0440	0.0455	0.0373	0.510	0.513	0.516	0.511
0.124	0.134	0.1492	0.1527	0.1321	0.514	0.526	0.531	0.514
0.240	0.257	0.2749	0.2780	0.2549	0.520	0.541	0.547	0.520
0.329	0.346	0.3648	0.3665	0.3483	0.526	0.550	0.557	0.525
0.508	0.536	0.5350	0.5324	0.5326	0.536	0.565	0.572	0.535
0.664	0.692	0.6782	0.6724	0.6879	0.546	0.573	0.578	0.545
0.770	0.792	0.7759	0.7695	0.7898	0.553	0.577	0.579	0.553
0.791	0.817	0.7955	0.7891	0.8098	0.555	0.577	0.579	0.555
0.867	0.890	0.8677	0.8622	0.8805	0.561	0.578	0.578	0.560
1.000	1.000	1.0000	1.0000	1.0000	0.573	0.573	0.573	0.573
$\overline{\Delta y}$		0.0148	0.0189	0.0037	%AAD	3.705	4.480	0.103

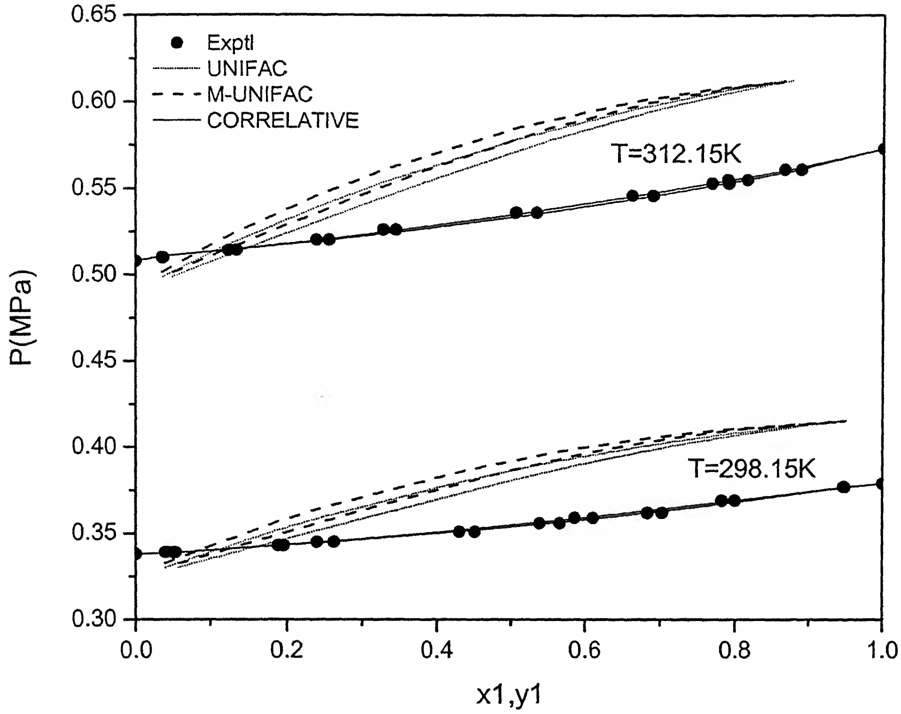

Figure 4.31 P-x-y diagram for R124 (1)/R142b (2) system using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

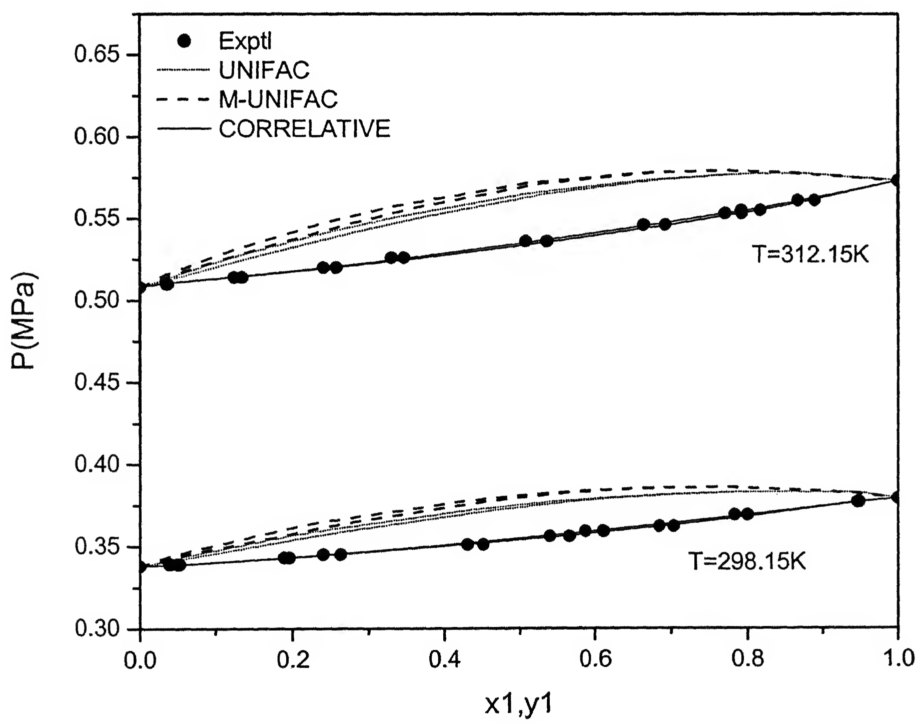

Figure 4.32 P-x-y diagram for R124 (1) / R142b (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

Table 4.35 Results of VLE Calculations for R124 (1) / R142b (2) System using Pure components as ref. fluids

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=298.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.338	0.338	0.338	0.338
0.039	0.041	0.0496	0.0516	0.0418	0.339	0.343	0.345	0.339
0.050	0.053	0.0631	0.0656	0.0535	0.339	0.344	0.346	0.339
0.189	0.196	0.2225	0.2270	0.2019	0.343	0.357	0.362	0.343
0.240	0.263	0.2764	0.2804	0.2562	0.345	0.361	0.366	0.345
0.431	0.452	0.4637	0.4636	0.4559	0.351	0.373	0.379	0.352
0.540	0.566	0.5644	0.5614	0.5669	0.356	0.378	0.383	0.357
0.587	0.611	0.6072	0.6030	0.6140	0.359	0.379	0.385	0.359
0.684	0.703	0.6955	0.6895	0.7093	0.362	0.382	0.386	0.363
0.783	0.800	0.7869	0.7802	0.8038	0.369	0.384	0.387	0.368
0.947	0.949	0.9455	0.9425	0.9536	0.377	0.383	0.383	0.377
1.000	1.000	1.0000	1.0000	1.0000	0.379	0.379	0.379	0.379
$\overline{\Delta y}$		0.0100	0.0136	0.0036	%AAD	4.027	5.146	0.133
T=312.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.508	0.508	0.508	0.508
0.035	0.037	0.0438	0.0454	0.0373	0.510	0.516	0.519	0.511
0.124	0.134	0.1487	0.1522	0.1321	0.514	0.529	0.534	0.514
0.240	0.257	0.2740	0.2772	0.2551	0.520	0.543	0.550	0.520
0.329	0.346	0.3638	0.3655	0.3485	0.526	0.553	0.560	0.525
0.508	0.536	0.5341	0.5314	0.5326	0.536	0.567	0.574	0.535
0.664	0.692	0.6774	0.6716	0.6879	0.546	0.575	0.580	0.545
0.770	0.792	0.7754	0.7689	0.7900	0.553	0.578	0.581	0.553
0.791	0.817	0.7950	0.7885	0.8098	0.555	0.578	0.581	0.555
0.867	0.890	0.8674	0.8619	0.8806	0.561	0.579	0.579	0.560
1.000	1.000	1.0000	1.0000	1.0000	0.573	0.573	0.573	0.573
$\overline{\Delta y}$		0.0149	0.0190	0.0036	%AAD	4.098	4.878	0.104

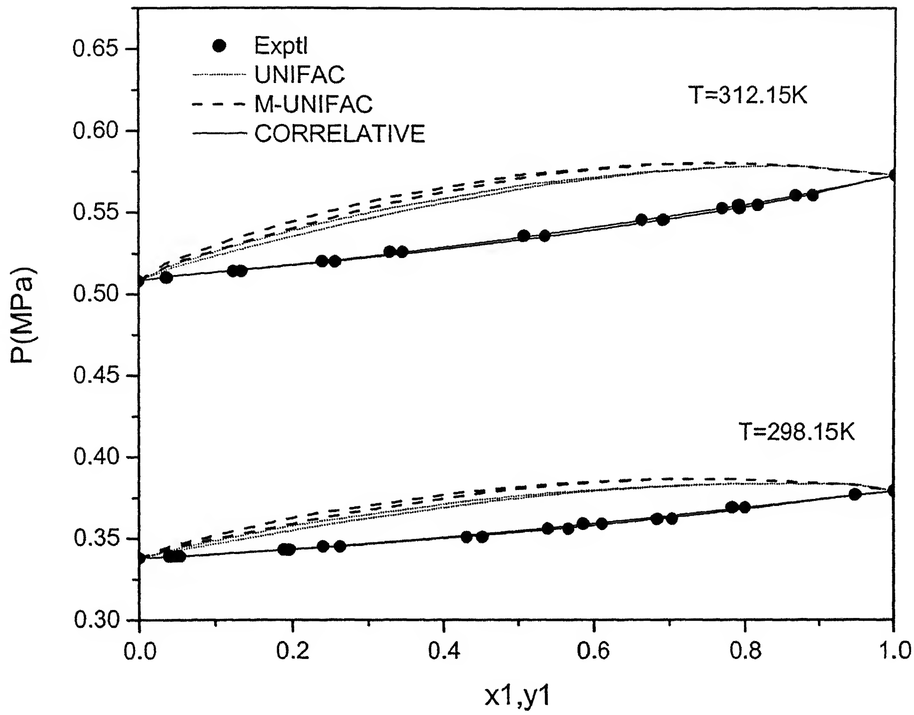

Figure 4.33 P-x-y diagram for R124 (1) / R142b (2) System using pure components as ref. fluids

Table 4.36 Results of VLE Calculations for R125 (1) / R134a (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=268.15K								
0.032	0.070	0.0702	0.0707	0.0702	0.254	0.255	0.255	0.255
0.153	0.275	0.2921	0.2933	0.2883	0.293	0.296	0.297	0.295
0.296	0.468	0.4898	0.4907	0.4800	0.338	0.347	0.348	0.342
0.463	0.672	0.6624	0.6625	0.6486	0.405	0.408	0.409	0.396
0.778	0.866	0.8873	0.8869	0.8772	0.494	0.527	0.527	0.498
0.926	0.963	0.9654	0.9651	0.9614	0.544	0.585	0.585	0.546
$\overline{\Delta y}$		0.0121	0.0124	0.0103	%AAD	3.120	3.277	0.939
T=273.15K								
0.038	0.077	0.0798	0.0804	0.0801	0.308	0.308	0.308	0.308
0.126	0.225	0.2405	0.2415	0.2387	0.341	0.342	0.343	0.342
0.256	0.414	0.4302	0.4311	0.4234	0.390	0.394	0.395	0.392
0.381	0.557	0.5740	0.5744	0.5630	0.438	0.445	0.447	0.438
0.519	0.693	0.7017	0.7016	0.6887	0.492	0.503	0.504	0.490
0.661	0.795	0.8086	0.8082	0.7962	0.542	0.564	0.565	0.542
0.784	0.879	0.8865	0.8860	0.8771	0.591	0.619	0.619	0.588
0.896	0.944	0.9485	0.9482	0.9433	0.633	0.669	0.669	0.630
$\overline{\Delta y}$		0.0107	0.0109	0.0051	%AAD	2.486	2.633	0.312
T=278.15K								
0.153	0.270	0.2762	0.2773	0.2746	0.415	0.417	0.418	0.418
0.392	0.561	0.5754	0.5759	0.5657	0.516	0.527	0.528	0.521
0.602	0.755	0.7593	0.7589	0.7474	0.611	0.628	0.629	0.610
0.784	0.873	0.8822	0.8817	0.8733	0.689	0.719	0.720	0.688
$\overline{\Delta y}$		0.0085	0.0087	0.0043	%AAD	2.454	2.643	0.498
T=283.15K								
0.049	0.094	0.0950	0.0956	0.0960	0.442	0.439	0.439	0.441
0.160	0.271	0.2793	0.2803	0.2784	0.493	0.494	0.495	0.496
0.264	0.407	0.4214	0.4223	0.4169	0.542	0.547	0.548	0.547
0.360	0.512	0.5326	0.5329	0.5250	0.591	0.597	0.599	0.593
0.472	0.631	0.6432	0.6433	0.6331	0.645	0.657	0.658	0.648
0.609	0.751	0.7573	0.7569	0.7464	0.713	0.732	0.733	0.714
0.786	0.873	0.8791	0.8787	0.8709	0.802	0.832	0.833	0.801
0.944	0.970	0.9705	0.9704	0.9679	0.882	0.925	0.925	0.880
$\overline{\Delta y}$		0.0087	0.0089	0.0054	%AAD	2.002	2.148	0.392

Table 4.36 (Continued)

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=293.15K								
0.055	0.097	0.0994	0.1000	0.1011	0.606	0.605	0.606	0.609
0.137	0.230	0.2311	0.2321	0.2324	0.658	0.656	0.657	0.660
0.255	0.386	0.3924	0.3933	0.3906	0.732	0.730	0.732	0.734
0.381	0.535	0.5361	0.5366	0.5305	0.816	0.813	0.815	0.812
0.526	0.662	0.6740	0.6739	0.6656	0.903	0.910	0.912	0.902
0.657	0.770	0.7796	0.7793	0.7707	0.983	1.002	1.004	0.983
0.931	0.958	0.9605	0.9603	0.9576	1.158	1.204	1.204	1.159
$\overline{\Delta y}$		0.0050	0.0053	0.0029	%AAD	1.107	1.068	0.258

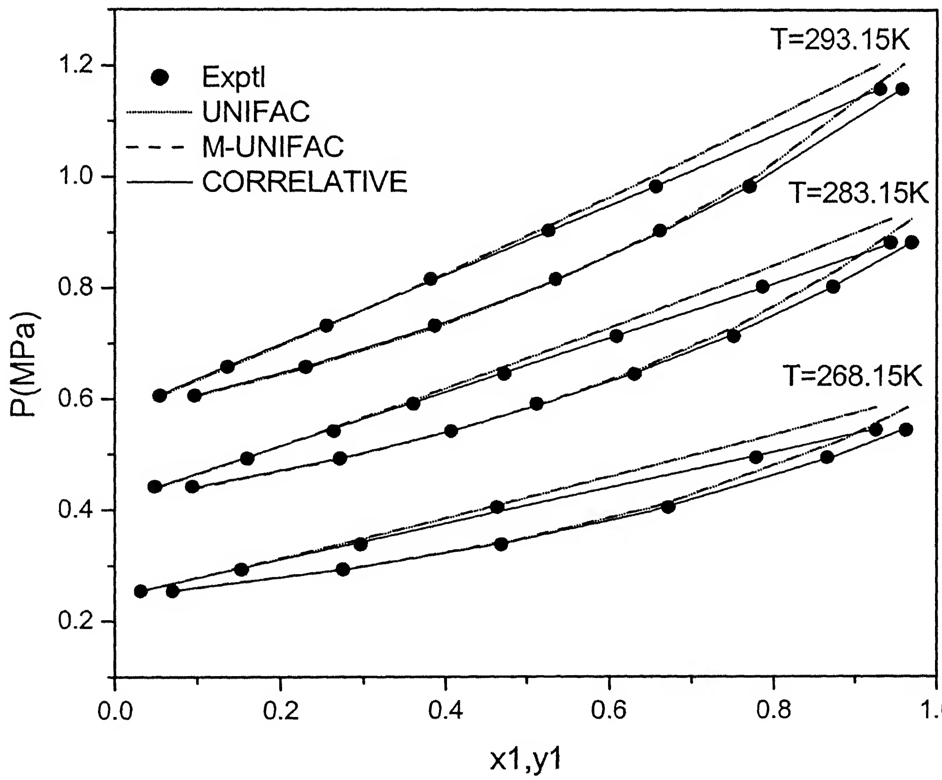

Figure 4.34 P-x-y diagram for R125 (1)/R134a (2) system using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

Table 4.37 Results of VLE Calculations for R125 (1) / R134a (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=268.15K								
0.032	0.070	0.0661	0.0666	0.0703	0.254	0.253	0.253	0.255
0.153	0.275	0.2788	0.2800	0.2884	0.293	0.290	0.291	0.295
0.296	0.468	0.4733	0.4741	0.4801	0.338	0.335	0.336	0.342
0.463	0.672	0.6476	0.6477	0.6486	0.405	0.388	0.389	0.396
0.778	0.866	0.8811	0.8805	0.8772	0.494	0.493	0.493	0.498
0.926	0.963	0.9634	0.9631	0.9614	0.544	0.543	0.544	0.546
$\overline{\Delta y}$		0.0088	0.0089	0.0103	%AAD	1.127	0.981	0.944
T=273.15K								
0.038	0.077	0.0758	0.0763	0.0802	0.308	0.306	0.306	0.308
0.126	0.225	0.2301	0.2313	0.2389	0.341	0.337	0.338	0.342
0.256	0.414	0.4160	0.4169	0.4234	0.390	0.383	0.384	0.392
0.381	0.557	0.5597	0.5601	0.5631	0.438	0.429	0.430	0.438
0.519	0.693	0.6895	0.6895	0.6887	0.492	0.480	0.481	0.490
0.661	0.795	0.7998	0.7994	0.7964	0.542	0.534	0.535	0.542
0.784	0.879	0.8810	0.8805	0.8772	0.591	0.582	0.583	0.588
0.896	0.944	0.9459	0.9456	0.9434	0.633	0.627	0.627	0.630
$\overline{\Delta y}$		0.0029	0.0030	0.0051	%AAD	1.489	1.331	0.313
T=278.15K								
0.153	0.270	0.2662	0.2674	0.2747	0.415	0.411	0.412	0.418
0.392	0.561	0.5631	0.5634	0.5658	0.516	0.510	0.511	0.521
0.602	0.755	0.7501	0.7498	0.7474	0.611	0.600	0.601	0.610
0.784	0.873	0.8773	0.8768	0.8734	0.689	0.681	0.682	0.688
$\overline{\Delta y}$		0.0037	0.0035	0.0044	%AAD	1.308	1.129	0.495
T=283.15K								
0.049	0.094	0.0914	0.0920	0.0960	0.442	0.437	0.437	0.441
0.160	0.271	0.2706	0.2717	0.2785	0.493	0.487	0.488	0.496
0.264	0.407	0.4108	0.4116	0.4171	0.542	0.535	0.537	0.547
0.360	0.512	0.5215	0.5219	0.5250	0.591	0.581	0.582	0.593
0.472	0.631	0.6332	0.6332	0.6333	0.645	0.635	0.636	0.648
0.609	0.751	0.7493	0.7490	0.7465	0.713	0.703	0.704	0.714
0.786	0.873	0.8748	0.8743	0.8710	0.802	0.793	0.794	0.801
0.944	0.970	0.9694	0.9693	0.9679	0.882	0.876	0.877	0.880
$\overline{\Delta y}$		0.0028	0.0029	0.0054	%AAD	1.265	1.104	0.394

Table 4.37 (Continued)

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=293.15K								
0.055	0.097	0.0968	0.0974	0.1011	0.606	0.603	0.603	0.609
0.137	0.230	0.2258	0.2267	0.2325	0.658	0.650	0.651	0.660
0.255	0.386	0.3850	0.3858	0.3907	0.732	0.719	0.721	0.734
0.381	0.535	0.5283	0.5286	0.5306	0.816	0.796	0.797	0.812
0.526	0.662	0.6671	0.6670	0.6657	0.903	0.886	0.888	0.902
0.657	0.770	0.7743	0.7739	0.7709	0.983	0.970	0.971	0.984
0.931	0.958	0.9594	0.9592	0.9577	1.158	1.154	1.155	1.159
$\overline{\Delta y}$		0.0033	0.0029	0.0030	%AAD	1.366	1.205	0.260

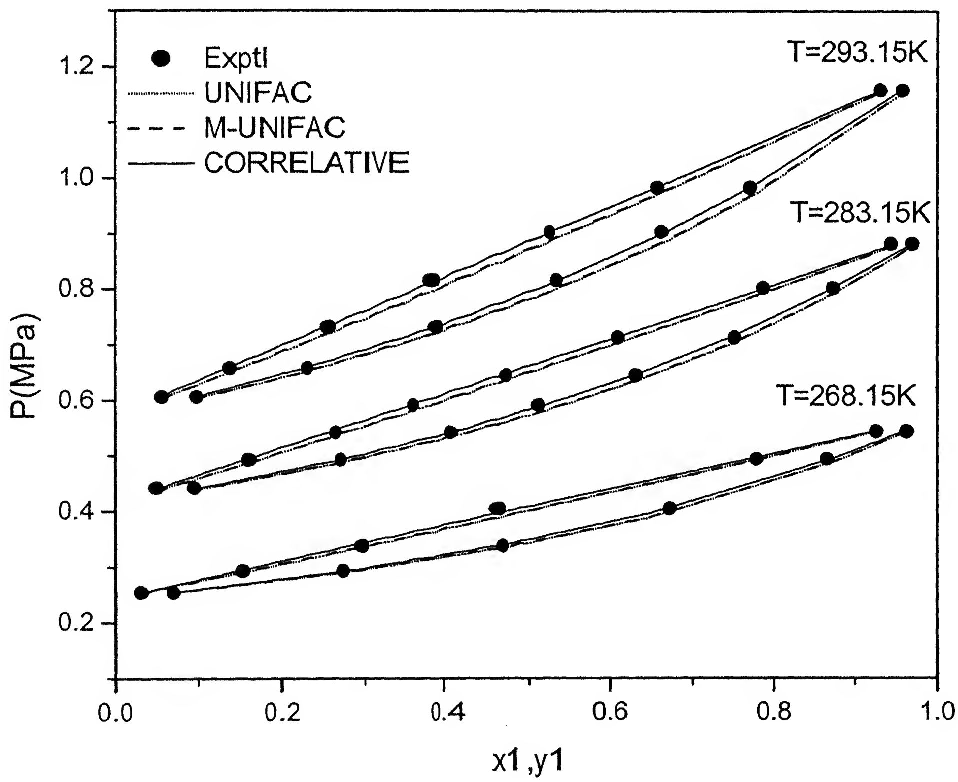

Figure 4.35 P-x-y diagram for R125 (1) / R134a (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

Table 4.38 Results of VLE Calculations for R125 (1) / R134a (2) System using Pure components as ref. fluids

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=268.15K								
0.032	0.070	0.0661	0.0666	0.0703	0.254	0.253	0.253	0.255
0.153	0.275	0.2788	0.2801	0.2884	0.293	0.290	0.291	0.295
0.296	0.468	0.4733	0.4742	0.4801	0.338	0.335	0.336	0.342
0.463	0.672	0.6476	0.6477	0.6486	0.405	0.388	0.389	0.396
0.778	0.866	0.8810	0.8806	0.8772	0.494	0.492	0.493	0.498
0.926	0.963	0.9634	0.9631	0.9615	0.544	0.543	0.543	0.546
$\overline{\Delta y}$		0.0088	0.0089	0.0103	%AAD	1.135	0.985	0.944
T=273.15K								
0.038	0.077	0.0757	0.0763	0.0802	0.308	0.306	0.306	0.308
0.126	0.225	0.2301	0.2313	0.2389	0.341	0.337	0.338	0.342
0.256	0.414	0.4159	0.4168	0.4235	0.390	0.383	0.384	0.392
0.381	0.557	0.5597	0.5602	0.5630	0.438	0.429	0.430	0.438
0.519	0.693	0.6895	0.6894	0.6887	0.492	0.480	0.481	0.490
0.661	0.795	0.7998	0.7994	0.7964	0.542	0.534	0.535	0.542
0.784	0.879	0.8809	0.8805	0.8772	0.591	0.582	0.583	0.588
0.896	0.944	0.9459	0.9455	0.9434	0.633	0.627	0.627	0.630
$\overline{\Delta y}$		0.0029	0.0030	0.0051	%AAD	1.497	1.340	0.314
T=278.15K								
0.153	0.270	0.2662	0.2673	0.2747	0.415	0.411	0.412	0.418
0.392	0.561	0.5630	0.5634	0.5658	0.516	0.510	0.511	0.521
0.602	0.755	0.7501	0.7498	0.7474	0.611	0.600	0.601	0.610
0.784	0.873	0.8772	0.8767	0.8734	0.689	0.681	0.682	0.688
$\overline{\Delta y}$		0.0037	0.0035	0.0044	%AAD	1.321	1.140	0.498
T=283.15K								
0.049	0.094	0.0914	0.0920	0.0960	0.442	0.437	0.437	0.441
0.160	0.271	0.2707	0.2716	0.2785	0.493	0.487	0.488	0.496
0.264	0.407	0.4107	0.4116	0.4171	0.542	0.535	0.537	0.547
0.360	0.512	0.5214	0.5220	0.5251	0.591	0.581	0.582	0.594
0.472	0.631	0.6331	0.6331	0.6333	0.645	0.635	0.636	0.648
0.609	0.751	0.7493	0.7490	0.7465	0.713	0.703	0.704	0.714
0.786	0.873	0.8747	0.8742	0.8710	0.802	0.793	0.794	0.801
0.944	0.970	0.9694	0.9692	0.9680	0.882	0.876	0.876	0.880
$\overline{\Delta y}$		0.0028	0.0029	0.0055	%AAD	1.276	1.116	0.396

Table 4.38 (Continued)

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=293.15K								
0.055	0.097	0.0968	0.0973	0.1011	0.606	0.603	0.603	0.609
0.137	0.230	0.2257	0.2266	0.2325	0.658	0.650	0.651	0.660
0.255	0.386	0.3849	0.3857	0.3907	0.732	0.719	0.721	0.734
0.381	0.535	0.5282	0.5286	0.5307	0.816	0.795	0.797	0.812
0.526	0.662	0.6671	0.6669	0.6657	0.903	0.886	0.887	0.902
0.657	0.770	0.7743	0.7739	0.7709	0.983	0.969	0.971	0.984
0.931	0.958	0.9594	0.9592	0.9577	1.158	1.154	1.155	1.159
$\overline{\Delta y}$		0.0033	0.0029	0.0029	%AAD	1.376	1.214	0.260

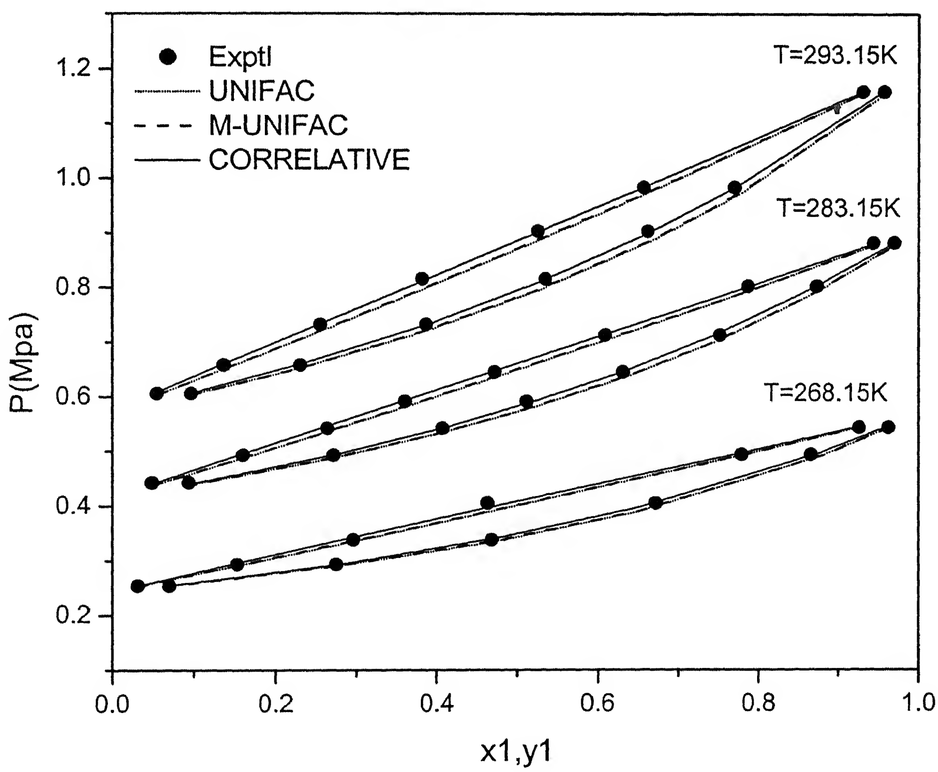

Figure 4.36 P-x-y diagram for R125 (1) / R134a (2) System using pure components as ref. fluids

Table 4.39 Results of VLE Calculations for R125 (1) / R152a (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

x_1	y_1				P (MPa)			
Exptl	Exptl	Calculated			Exptl	Calculated		
		UNIFAC	M-UNIFAC	CORRELATIVE		UNIFAC	M-UNIFAC	CORRELATIVE
T=293.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.514	0.514	0.514	0.514
0.127	0.218	0.3071	0.3322	0.2087	0.597	0.555	0.604	0.593
0.201	0.315	0.4221	0.4412	0.3174	0.633	0.624	0.682	0.634
0.327	0.485	0.5659	0.5702	0.4805	0.710	0.734	0.795	0.709
0.505	0.662	0.7110	0.6990	0.6673	0.824	0.876	0.927	0.827
0.654	0.784	0.8071	0.7891	0.7910	0.929	0.991	1.026	0.935
0.851	0.917	0.9190	0.9055	0.9205	1.084	1.142	1.148	1.089
1.000	1.000	1.0000	1.0000	1.0000	1.207	1.207	1.207	1.207
$\overline{\Delta y}$		0.0585	0.0632	0.0053	%AAD	5.014	8.262	0.399

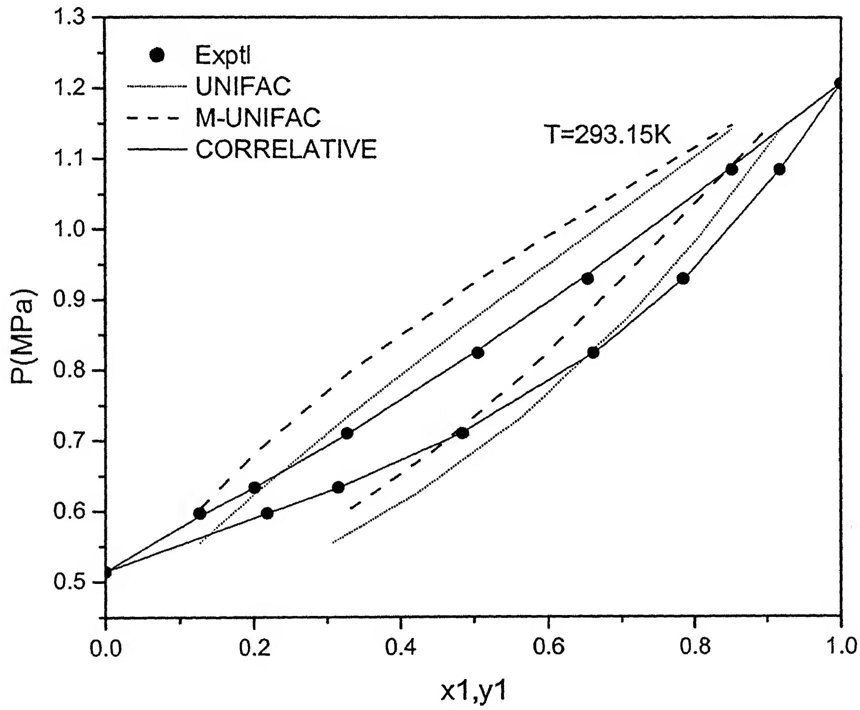

Figure 4.37 P-x-y diagram for R125 (1)/R152a (2) system using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

Table 4.40 Results of VLE Calculations for R125 (1) / R152a (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=293.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.514	0.514	0.514	0.514
0.127	0.218	0.2645	0.2856	0.2098	0.597	0.630	0.681	0.594
0.201	0.315	0.3731	0.3902	0.3181	0.633	0.691	0.751	0.634
0.327	0.485	0.5165	0.5209	0.4802	0.710	0.786	0.851	0.709
0.505	0.662	0.6694	0.6572	0.6667	0.824	0.908	0.964	0.827
0.654	0.784	0.7754	0.7555	0.7910	0.929	1.001	1.042	0.935
0.851	0.917	0.9037	0.8868	0.9210	1.084	1.119	1.128	1.090
1.000	1.000	1.0000	1.0000	1.0000	1.207	1.207	1.207	1.207
$\overline{\Delta y}$		0.0276	0.0404	0.0053	%AAD	7.750	14.295	0.398

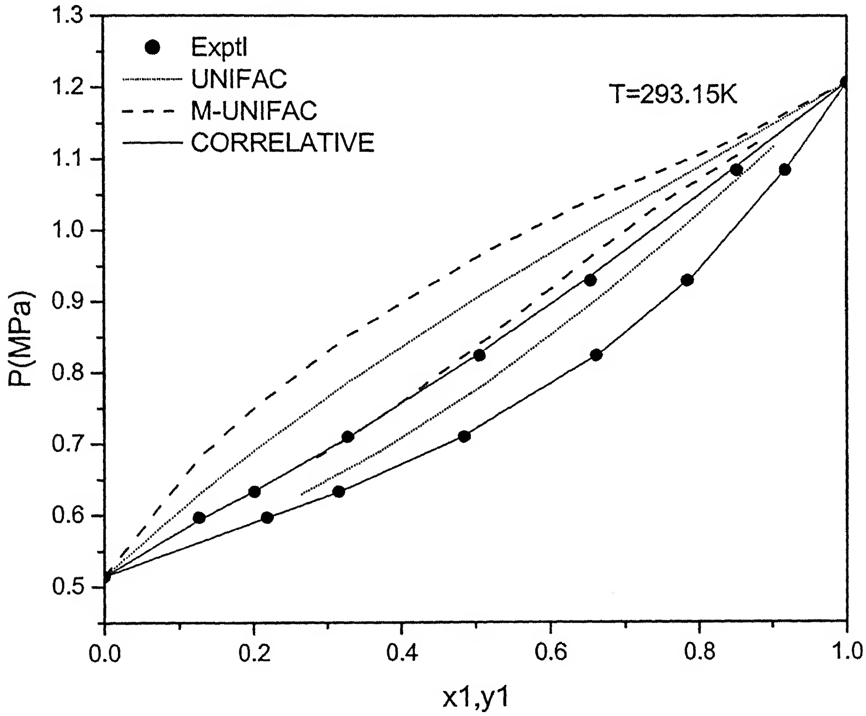

Figure 4.38 P-x-y diagram for R125 (1) / R152a (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

Table 4.41 Results of VLE Calculations for R125 (1) / R152a (2) System using Pure components as ref. fluids

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=263.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.514	0.514	0.514	0.514
0.127	0.218	0.2645	0.2856	0.2098	0.597	0.629	0.680	0.594
0.201	0.315	0.3732	0.3904	0.3180	0.633	0.690	0.750	0.634
0.327	0.485	0.5166	0.5212	0.4801	0.710	0.786	0.851	0.709
0.505	0.662	0.6696	0.6574	0.6667	0.824	0.907	0.964	0.827
0.654	0.784	0.7756	0.7556	0.7910	0.929	1.001	1.042	0.935
0.851	0.917	0.9037	0.8869	0.9210	1.084	1.119	1.127	1.090
1.000	1.000	1.0000	1.0000	1.0000	1.207	1.207	1.207	1.207
0.000	0.000	0.0276	0.0404	0.0053	0.000	7.693	14.236	0.398
$\overline{\Delta y}$		0.0276	0.0404	0.0053	%AAD	7.693	14.236	0.398

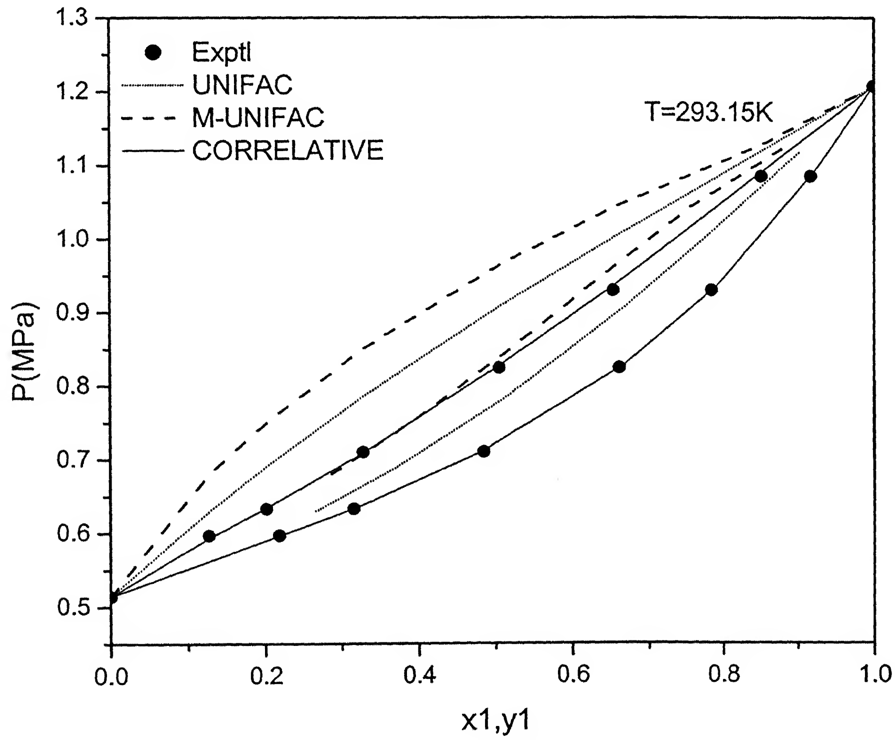

Figure 4.39 P-x-y diagram for R125 (1) / R152a (2) System using pure components as ref. fluids

Table 4.42 Results of VLE Calculations for R125 (1) / R236ea (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=288.44K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.1463	0.1463	0.1463	0.1463
0.1419	0.5145	0.3961	0.3960	0.5153	0.2724	0.3094	0.3093	0.2741
0.2585	0.6734	0.5846	0.5844	0.6818	0.3718	0.3989	0.3987	0.3767
0.3715	0.7722	0.7072	0.7072	0.7761	0.4702	0.4922	0.4920	0.4754
0.5329	0.8594	0.8249	0.8248	0.8616	0.6141	0.6356	0.6353	0.6166
0.6599	0.9078	0.8889	0.8889	0.9087	0.7261	0.7557	0.7554	0.7296
0.7771	0.9434	0.9345	0.9345	0.9438	0.8349	0.8719	0.8715	0.8371
0.8831	0.9713	0.9682	0.9682	0.9715	0.9383	0.9815	0.9811	0.9392
1.0000	1.0000	1.0000	1.0000	1.0000	1.0600	1.0600	1.0600	1.0600
$\overline{\Delta y}$		0.0483	0.0483	0.0024	%AAD	6.023	5.982	0.618
T=303.19K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.2450	0.2450	0.2450	0.2450
0.1059	0.3866	0.2932	0.2930	0.3912	0.3749	0.4320	0.4320	0.3774
0.2226	0.5900	0.5031	0.5029	0.5966	0.5171	0.5534	0.5534	0.5217
0.3274	0.7019	0.6335	0.6334	0.7057	0.6452	0.6711	0.6710	0.6512
0.4510	0.7900	0.7446	0.7445	0.7922	0.7990	0.8198	0.8197	0.8046
0.5674	0.8499	0.8220	0.8220	0.8513	0.9477	0.9691	0.9690	0.9514
0.6915	0.9006	0.8858	0.8858	0.9010	1.1070	1.1379	1.1377	1.1125
0.7913	0.9351	0.9276	0.9276	0.9352	1.2480	1.2812	1.2810	1.2480
0.8884	0.9658	0.9631	0.9631	0.9658	1.3914	1.4284	1.4282	1.3879
1.0000	1.0000	1.0000	1.0000	1.0000	1.5684	1.5684	1.5684	1.5684
$\overline{\Delta y}$		0.0434	0.0435	0.0024	%AAD	4.903	4.891	0.539
T=318.24K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.3949	0.3949	0.3949	0.3949
0.0768	0.2709	0.2054	0.2053	0.2765	0.5216	0.5971	0.5973	0.5230
0.2015	0.5115	0.4398	0.4396	0.5224	0.7287	0.7686	0.7686	0.7328
0.3313	0.6615	0.6052	0.6050	0.6678	0.9439	0.9640	0.9639	0.9524
0.4606	0.7600	0.7224	0.7224	0.7631	1.1678	1.1752	1.1753	1.1744
0.5820	0.8289	0.8056	0.8055	0.8296	1.3834	1.3887	1.3887	1.3890
0.7010	0.8828	0.8706	0.8706	0.8829	1.6054	1.6129	1.6130	1.6084
0.8066	0.9257	0.9195	0.9195	0.9248	1.8183	1.8266	1.8265	1.8160
0.9097	0.9645	0.9628	0.9628	0.9642	2.0416	2.0529	2.0529	2.0369
1.0000	1.0000	1.0000	1.0000	1.0000	2.2633	2.2633	2.2633	2.2633
$\overline{\Delta y}$		0.0343	0.0344	0.0035	%AAD	3.071	3.075	0.405

Table 4.43 Results of VLE Calculations for R125 (1) / R236ea (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRE LATIVE	Exptl	UNIFAC	M-UNIFAC	CORRE LATIVE
T=288.44K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.1463	0.1463	0.1463	0.1463
0.1419	0.5145	0.4691	0.4689	0.5170	0.2724	0.2456	0.2455	0.2747
0.2585	0.6734	0.6561	0.6560	0.6830	0.3718	0.3364	0.3363	0.3776
0.3715	0.7722	0.7667	0.7666	0.7770	0.4702	0.4316	0.4314	0.4764
0.5329	0.8594	0.8649	0.8649	0.8620	0.6141	0.5774	0.5772	0.6174
0.6599	0.9078	0.9154	0.9154	0.9089	0.7261	0.6986	0.6983	0.7301
0.7771	0.9434	0.9503	0.9503	0.9438	0.8349	0.8147	0.8146	0.8373
0.8831	0.9713	0.9758	0.9758	0.9716	0.9383	0.9242	0.9238	0.9393
1.0000	1.0000	1.0000	1.0000	1.0000	1.0600	1.0600	1.0600	1.0600
$\overline{\Delta y}$		0.0133	0.0133	0.0030	%AAD	5.894	5.929	0.738
T=303.19K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.2450	0.2450	0.2450	0.2450
0.1059	0.3866	0.3458	0.3456	0.3925	0.3749	0.3484	0.3484	0.3779
0.2226	0.5900	0.5649	0.5648	0.5978	0.5171	0.4724	0.4724	0.5226
0.3274	0.7019	0.6899	0.6899	0.7066	0.6452	0.5936	0.5935	0.6522
0.4510	0.7900	0.7897	0.7897	0.7928	0.7990	0.7469	0.7468	0.8057
0.5674	0.8499	0.8557	0.8557	0.8517	0.9477	0.9002	0.9001	0.9524
0.6915	0.9006	0.9082	0.9082	0.9013	1.1070	1.0728	1.0725	1.1133
0.7913	0.9351	0.9419	0.9419	0.9354	1.2480	1.2184	1.2182	1.2488
0.8884	0.9658	0.9702	0.9702	0.9659	1.3914	1.3679	1.3677	1.3886
1.0000	1.0000	1.0000	1.0000	1.0000	1.5684	1.5684	1.5684	1.5684
$\overline{\Delta y}$		0.0129	0.0129	0.0030	%AAD	5.230	5.312	0.638
T=318.24K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.3949	0.3949	0.3949	0.3949
0.0768	0.2709	0.2388	0.2386	0.2772	0.5216	0.4934	0.4935	0.5232
0.2015	0.5115	0.4897	0.4896	0.5233	0.7287	0.6689	0.6690	0.7333
0.3313	0.6615	0.6527	0.6527	0.6685	0.9439	0.8711	0.8713	0.9530
0.4606	0.7600	0.7614	0.7614	0.7637	1.1678	1.0906	1.0905	1.1752
0.5820	0.8289	0.8350	0.8349	0.8302	1.3834	1.3120	1.3119	1.3898
0.7010	0.8828	0.8907	0.8907	0.8833	1.6054	1.5436	1.5436	1.6094
0.8066	0.9257	0.9320	0.9319	0.9251	1.8183	1.7636	1.7636	1.8171
0.9097	0.9645	0.9683	0.9683	0.9643	2.0416	1.9969	1.9970	2.0382
1.0000	1.0000	1.0000	1.0000	1.0000	2.2633	2.2633	2.2633	2.2633
$\overline{\Delta y}$		0.0110	0.0110	0.0039	%AAD	5.268	5.265	0.435

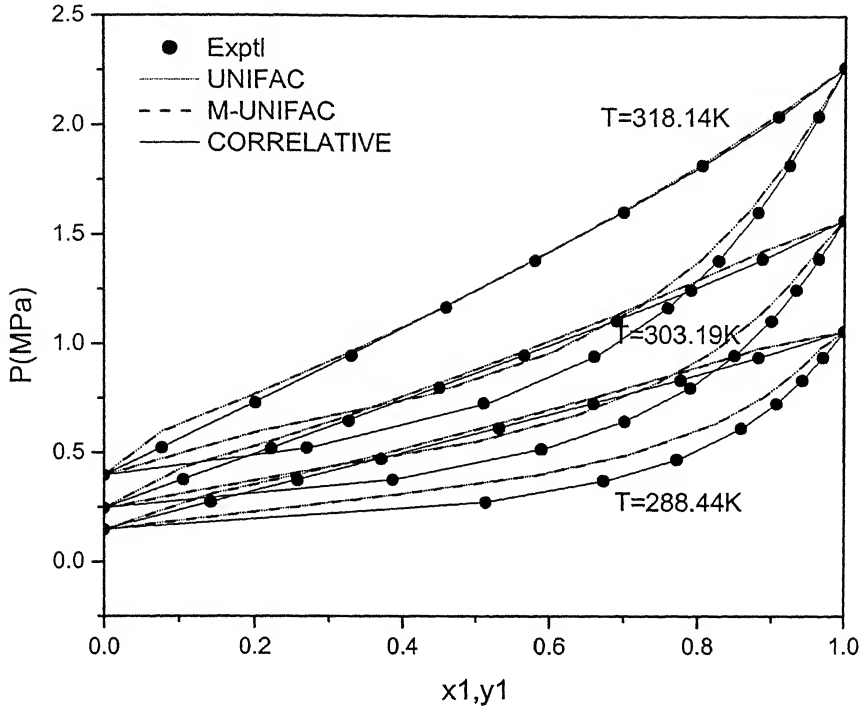

Figure 4.40 P-x-y diagram for R125 (1)/R236ea (2) system using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

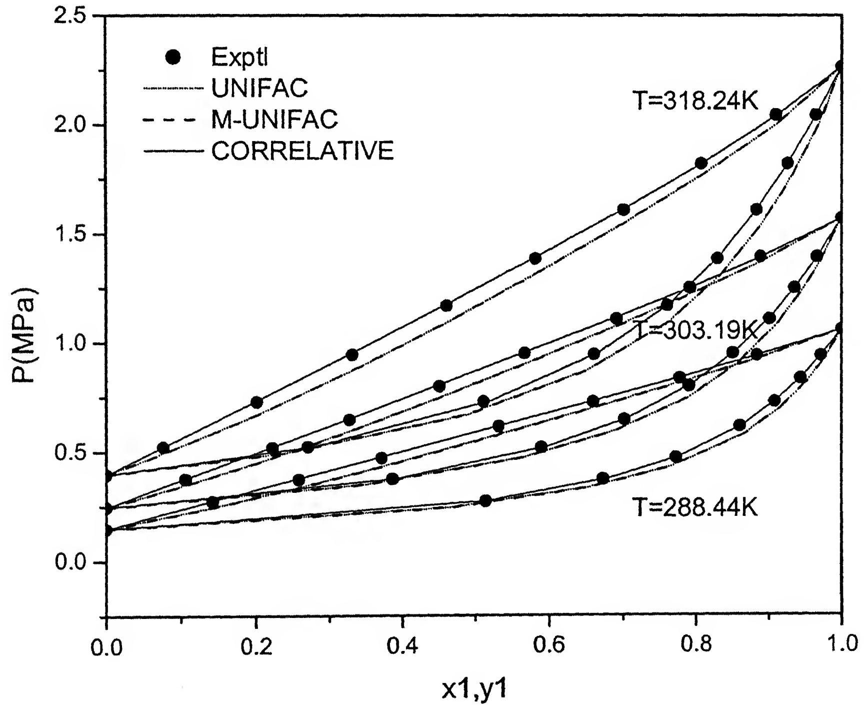

Figure 4.41 P-x-y diagram for R125 (1) / R236ea (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

Table 4.44 Results of VLE Calculations for R125 (1) / R236ea (2) System using Pure components as ref. fluids

x_1	y_1				P (MPa)			
Exptl	Exptl	Calculated			Exptl	Calculated		
		UNIFAC	M-UNIFAC	CORRELATIVE		UNIFAC	M-UNIFAC	CORRELATIVE
T=288.44K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.1463	0.1463	0.1463	0.1463
0.1419	0.5145	0.4651	0.4649	0.5145	0.2724	0.2446	0.2445	0.2739
0.2585	0.6734	0.6537	0.6535	0.6818	0.3718	0.3348	0.3347	0.3767
0.3715	0.7722	0.7657	0.7656	0.7766	0.4702	0.4300	0.4298	0.4759
0.5329	0.8594	0.8649	0.8649	0.8622	0.6141	0.5765	0.5762	0.6175
0.6599	0.9078	0.9157	0.9157	0.9090	0.7261	0.6984	0.6981	0.7305
0.7771	0.9434	0.9506	0.9506	0.9439	0.8349	0.8153	0.8150	0.8379
0.8831	0.9713	0.9760	0.9760	0.9716	0.9383	0.9250	0.9247	0.9397
1.0000	1.0000	1.0000	1.0000	1.0000	1.0600	1.0600	1.0600	1.0600
$\overline{\Delta y}$		0.0144	0.0145	0.0025	%AAD	6.061	6.096	0.680
T=303.19K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.2450	0.2450	0.2450	0.2450
0.1059	0.3866	0.3460	0.3459	0.3913	0.3749	0.3457	0.3457	0.3775
0.2226	0.5900	0.5662	0.5660	0.5973	0.5171	0.4697	0.4696	0.5223
0.3274	0.7019	0.6915	0.6915	0.7066	0.6452	0.5912	0.5912	0.6522
0.4510	0.7900	0.7914	0.7913	0.7930	0.7990	0.7455	0.7453	0.8062
0.5674	0.8499	0.8572	0.8572	0.8519	0.9477	0.9000	0.8999	0.9532
0.6915	0.9006	0.9093	0.9092	0.9013	1.1070	1.0736	1.0734	1.1139
1.0000	1.0000	1.0000	1.0000	1.0000	1.5684	1.5684	1.5684	1.5684
$\overline{\Delta y}$		0.0154	0.0154	0.0037	%AAD	6.679	6.691	0.815
T=318.24K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.3949	0.3949	0.3949	0.3949
0.0768	0.2709	0.2419	0.2417	0.2770	0.5216	0.4844	0.4846	0.5233
0.2015	0.5115	0.4944	0.4943	0.5234	0.7287	0.6602	0.6604	0.7337
0.3313	0.6615	0.6574	0.6573	0.6688	0.9439	0.8634	0.8634	0.9541
0.4606	0.7600	0.7653	0.7652	0.7640	1.1678	1.0840	1.0841	1.1766
1.0000	1.0000	1.0000	1.0000	1.0000	2.2633	2.2633	2.2633	2.2633
$\overline{\Delta y}$		0.0139	0.0140	0.0073	%AAD	8.059	8.041	0.713

Table 4.45 Results of VLE Calculations for R125 (1) / R290 (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=273.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.4746	0.4746	0.4746	0.4746
0.0979	0.2731	0.2362	0.3258	0.2409	0.5956	0.5823	0.6723	0.5751
0.2180	0.4446	0.3919	0.4670	0.4045	0.6964	0.6682	0.7984	0.6683
0.5840	0.6838	0.6282	0.5993	0.6603	0.8103	0.7731	0.8868	0.8062
0.8005	0.8014	0.7646	0.6884	0.7984	0.8341	0.7702	0.8595	0.8275
1.0000	1.0000	1.0000	1.0000	1.0000	0.6701	0.6701	0.6701	0.6701
$\overline{\Delta y}$		0.0455	0.0681	0.0247	%AAD	4.633	9.998	2.197
T=283.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.6361	0.6361	0.6361	0.6361
0.0992	0.2811	0.2275	0.3084	0.2310	0.7835	0.7763	0.8914	0.7650
0.2293	0.4398	0.3913	0.4581	0.4023	0.9308	0.8954	1.0660	0.8930
0.5760	0.6677	0.6234	0.5999	0.6513	1.0742	1.0311	1.1878	1.0672
0.8286	0.8027	0.7943	0.7259	0.8226	1.1015	1.0255	1.1358	1.0994
1.0000	1.0000	1.0000	1.0000	1.0000	0.9088	0.9088	0.9088	0.9088
$\overline{\Delta y}$		0.0387	0.0475	0.0310	%AAD	3.909	10.495	1.815
T=293.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.8365	0.8365	0.8365	0.8365
0.0993	0.1923	0.2165	0.2885	0.2191	1.0105	1.0131	1.1579	0.9940
0.2567	0.4243	0.4046	0.4597	0.4152	1.1872	1.1908	1.4155	1.1831
0.5800	0.6653	0.6244	0.6032	0.6487	1.3963	1.3517	1.5637	1.3874
0.8312	0.8089	0.8026	0.7443	0.8267	1.4320	1.3474	1.4935	1.4314
1.0000	1.0000	1.0000	1.0000	1.0000	1.2053	1.2053	1.2053	1.2053
$\overline{\Delta y}$		0.0226	0.0646	0.0176	%AAD	2.417	12.523	0.665
T=303.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	1.0796	1.0796	1.0796	1.0796
0.0974	0.2147	0.2021	0.2645	0.2040	1.2617	1.2963	1.4742	1.2635
0.2069	0.3795	0.3433	0.4010	0.3499	1.4716	1.4654	1.7326	1.4380
0.5769	0.6541	0.6202	-	0.6407	1.7797	1.7406	-	1.7667
0.8328	0.8134	0.8096	-	0.8296	1.8258	1.7416	-	1.8293
1.0000	1.0000	1.0000	1.0000	1.0000	1.5656	1.5656	1.5656	1.5656
$\overline{\Delta y}$		0.0216	0.0357	0.0175	%AAD	2.493	17.290	0.838
T=313.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	1.3684	1.3684	1.3684	1.3684
0.0901	0.1899	0.1790	0.2307	0.1803	1.5685	1.6218	1.8307	1.5674
0.2140	0.3536	0.3362	0.3841	0.3421	1.8419	1.8598	2.1967	1.8081
0.5671	0.6439	0.6095	-	0.6263	2.2368	2.2053	-	2.2076
0.8287	0.8141	0.8112	-	0.8274	2.3058	2.2210	-	2.2998
1.0000	1.0000	1.0000	1.0000	1.0000	2.0039	2.0039	2.0039	2.0039
$\overline{\Delta y}$		0.0164	0.0356	0.0130	%AAD	2.365	17.989	0.869

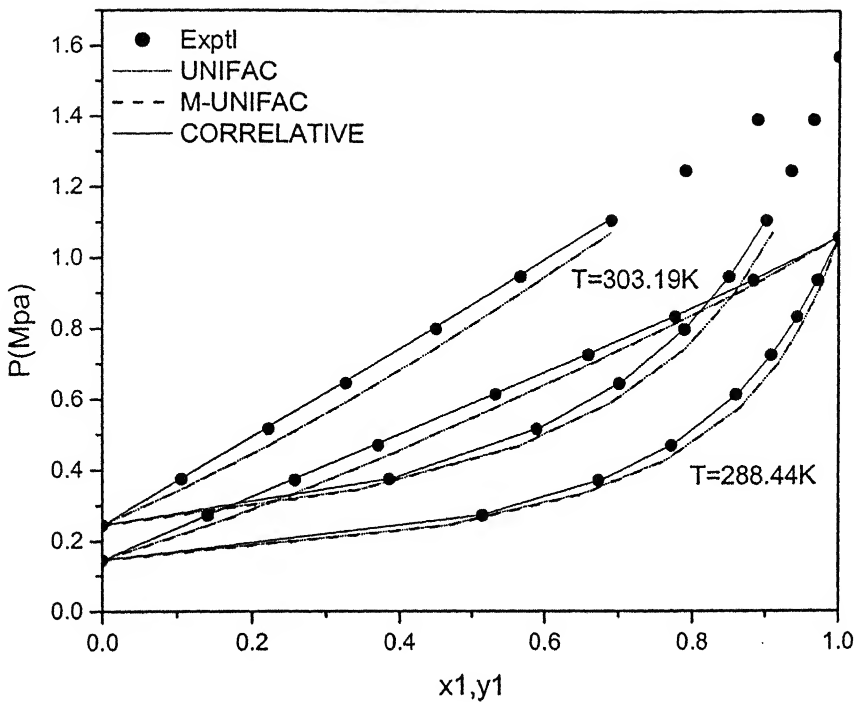

Figure 4.42 P-x-y diagram for R125 (1) / R236ea (2) System using pure components as ref. fluids

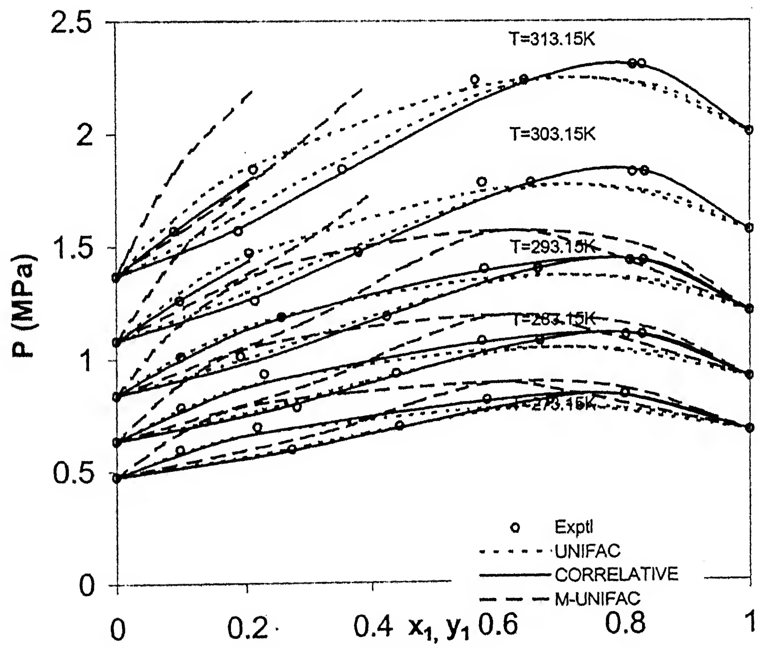

Figure 4.43 P-x-y diagram for R125 (1)/R290 (2) system using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

Table 4.46 Results of VLE Calculations for R125 (1) / R290 (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=273.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.4746	0.4746	0.4746	0.4746
0.0979	0.2731	0.2238	0.3083	0.2380	0.5956	0.5694	0.6510	0.5740
0.2180	0.4446	0.3782	0.4518	0.4033	0.6964	0.6469	0.7676	0.6671
0.5840	0.6838	0.6165	0.5875	0.6611	0.8103	0.7387	0.8484	0.8065
0.8005	0.8014	0.7525	0.6719	0.7973	0.8341	0.7293	0.8191	0.8274
1.0000	1.0000	1.0000	1.0000	1.0000	0.6701	0.6701	0.6701	0.6701
$\overline{\Delta y}$		0.0580	0.0671	0.0258	%AAD	8.228	6.508	2.278
T=283.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.6361	0.6361	0.6361	0.6361
0.0992	0.2811	0.2178	0.2946	0.2288	0.7835	0.7624	0.8690	0.7638
0.2293	0.4398	0.3810	0.4467	0.4017	0.9308	0.8723	1.0331	0.8918
0.5760	0.6677	0.6148	0.5913	0.6521	1.0742	0.9943	1.1460	1.0681
0.8286	0.8027	0.7853	0.7127	0.8213	1.1015	0.9797	1.0905	1.0994
1.0000	1.0000	1.0000	1.0000	1.0000	0.9088	0.9088	0.9088	0.9088
$\overline{\Delta y}$		0.0481	0.0467	0.0311	%AAD	6.870	7.396	1.864
T=293.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.8365	0.8365	0.8365	0.8365
0.0993	0.1923	0.2094	0.2779	0.2173	1.0105	0.9991	1.1353	0.9927
0.2567	0.4243	0.3975	0.4519	0.4153	1.1872	1.1660	1.3810	1.1824
0.5800	0.6653	0.6184	0.5972	0.6495	1.3963	1.3137	1.5200	1.3887
0.8312	0.8089	0.7959	0.7343	0.8255	1.4320	1.2995	1.4453	1.4314
1.0000	1.0000	1.0000	1.0000	1.0000	1.2053	1.2053	1.2053	1.2053
$\overline{\Delta y}$		0.0259	0.0640	0.0166	%AAD	4.522	9.617	0.687
T=303.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	1.0796	1.0796	1.0796	1.0796
0.0974	0.2147	0.1970	0.2568	0.2026	1.2617	1.2829	1.4527	1.2622
0.2069	0.3795	0.3382	0.3948	0.3496	1.4716	1.4443	1.7014	1.4369
0.5769	0.6541	0.6165	-	0.6413	1.7797	1.7040	-	1.7683
0.8328	0.8134	0.8049	0.7546	0.8285	1.8258	1.6944	1.8867	1.8290
1.0000	1.0000	1.0000	1.0000	1.0000	1.5656	1.5656	1.5656	1.5656
$\overline{\Delta y}$		0.0263	0.0388	0.0175	%AAD	3.748	11.362	0.804
T=313.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	1.3684	1.3684	1.3684	1.3684
0.0901	0.1899	0.1757	0.2252	0.1793	1.5685	1.6102	1.8117	1.5663
0.2140	0.3536	0.3331	0.3803	0.3419	1.8419	1.8404	2.1678	1.8070
0.5671	0.6439	0.6076	-	0.6268	2.2368	2.1733	-	2.2094
0.8287	0.8141	0.8081	-	0.8264	2.3058	2.1785	-	2.2988
1.0000	1.0000	1.0000	1.0000	1.0000	2.0039	2.0039	2.0039	2.0039
$\overline{\Delta y}$		0.0193	0.0310	0.0129	%AAD	2.776	16.599	0.891

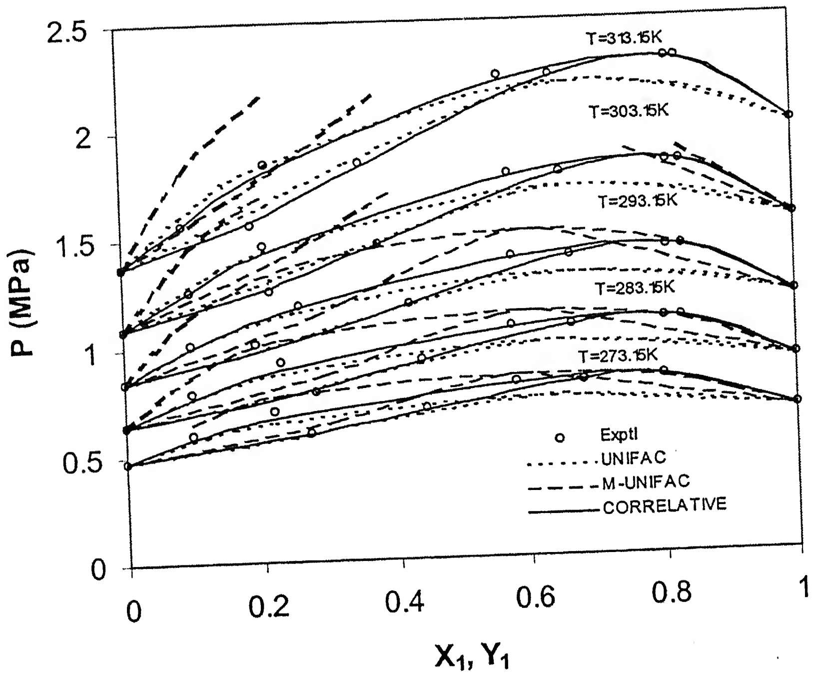

Figure 4.44 P-x-y diagram for R125 (1) / R290 (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

Table 4.47 Results of VLE Calculations for R125 (1) / R290 (2) System using Pure components as ref. fluids

x1	y1				P (MPa)			
Exptl	Exptl	Calculated			Exptl	Calculated		
		UNIFAC	M-UNIFAC	CORRELATIVE		UNIFAC	M-UNIFAC	CORRELATIVE
T=273.15K								
0.0000	0.0000	0.00000	0.00000	0.00000	0.4746	0.47460	0.47460	0.47460
0.0979	0.2731	0.22428	0.30948	0.23897	0.5956	0.57079	0.65319	0.57427
0.2180	0.4446	0.37815	0.45203	0.40381	0.6964	0.64844	0.76975	0.66749
0.5840	0.6838	0.61566	0.58640	0.66086	0.8103	0.73949	0.84954	0.80670
0.8005	0.8014	0.75177	0.67078	0.79709	0.8341	0.72967	0.81991	0.82735
1.0000	1.0000	1.00000	1.00000	1.00000	0.6701	0.67010	0.67010	0.67010
$\overline{\Delta y}$		0.05826	0.06796	0.02554	%ADD	8.07780	6.68650	2.24660
T=283.15K								
0.0000	0.0000	0.00000	0.00000	0.00000	0.6361	0.63610	0.63610	0.63610
0.0992	0.2811	0.21784	0.29488	0.22933	0.7835	0.76514	0.87236	0.76412
0.2293	0.4398	0.38036	0.44631	0.40199	0.9308	0.87484	1.03630	0.89222
0.5760	0.6677	0.61378	0.59011	0.65200	1.0742	0.99587	1.14810	1.06810
0.8286	0.8027	0.78454	0.71168	0.82121	1.1015	0.98036	1.09170	1.09920
1.0000	1.0000	1.00000	1.00000	1.00000	0.9088	0.90880	0.90880	0.90880
$\overline{\Delta y}$		0.04870	0.04723	0.03095	%ADD	6.66130	7.61120	1.84860
T=293.15K								
0.0000	0.0000	0.00000	0.00000	0.00000	0.8365	0.83650	0.83650	0.83650
0.0993	0.1923	0.20891	0.27754	0.21763	1.0105	1.00340	1.14020	0.99307
0.2567	0.4243	0.39643	-	0.41515	1.1872	1.16980	-	1.18250
1.0000	1.0000	1.00000	1.00000	1.00000	1.2053	1.20530	1.20530	1.20530
$\overline{\Delta y}$		0.02224	0.08524	0.01724	%ADD	1.08200	12.8330	1.06150

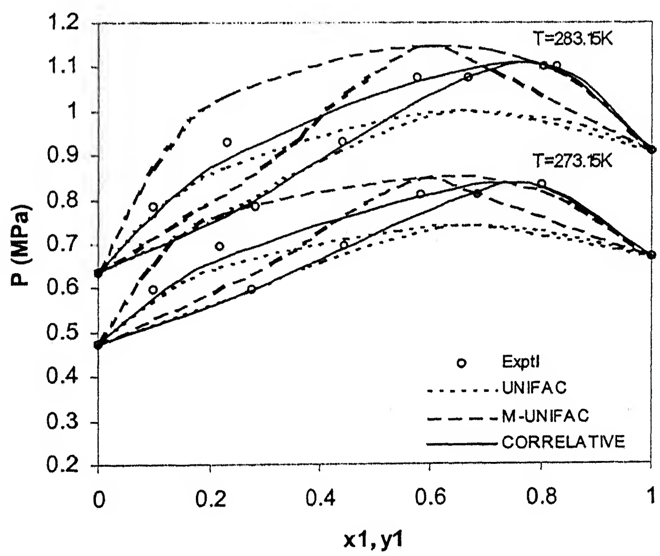

Figure 4.45 P-x-y diagram for R12 (1) / R290 (2) System using pure components as ref. fluids

Table 4.48 Results of VLE Calculations for R125 (1) / R600a (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=293.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.3045	0.3045	0.3045	0.3045
0.0379	0.2714	0.2327	0.2910	0.2680	0.4279	0.4013	0.4366	0.4255
0.0848	0.4411	0.3943	0.4606	0.4343	0.5529	0.4993	0.5684	0.5436
0.1590	0.5697	0.5345	0.5889	0.5664	0.6988	0.6281	0.7291	0.6903
0.2634	0.6608	0.6393	0.6734	0.6570	0.8354	0.7670	0.8823	0.8343
0.3693	0.7138	0.7030	0.7201	0.7089	0.9333	0.8727	0.9827	0.9326
0.6454	0.8056	0.8148	0.8022	0.8002	1.1092	1.0685	1.1415	1.0926
0.8146	0.8736	0.8873	0.8690	0.8700	1.1750	1.1686	1.2166	1.1674
0.8884	0.9092	0.9264	0.9108	0.9122	1.1982	1.2094	1.2428	1.1937
0.9507	0.9563	0.9649	0.9558	0.9568	1.2067	1.2414	1.2580	1.2099
0.9647	0.9676	0.9744	0.9675	0.9683	1.2093	1.2481	1.2601	1.2125
0.9707	0.9727	0.9786	0.9727	0.9734	1.2102	1.2509	1.2609	1.2134
0.9716	0.9734	0.9792	0.9735	0.9742	1.2108	1.2513	1.2610	1.2136
0.9807	0.9797	0.9857	0.9816	0.9821	1.2106	1.2555	1.2619	1.2148
1.0000	1.0000	1.0000	1.0000	1.0000	1.2036	1.2036	1.2036	1.2036
$\overline{\Delta y}$		0.0174	0.0069	0.0030	%AAD	4.797	3.944	0.581
T=303.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.4070	0.4070	0.4070	0.4070
0.0816	0.3998	0.3605	0.4208	0.3976	0.6900	0.6347	0.7141	0.6811
0.0977	0.4474	0.4000	0.4594	0.4363	0.7376	0.6726	0.7630	0.7250
0.1492	0.5277	0.4946	0.5469	0.5259	0.8492	0.7827	0.8997	0.8491
0.2085	0.5977	0.5677	0.6093	0.5916	0.9714	0.8912	1.0254	0.9651
0.2889	0.6515	0.6352	0.6629	0.6493	1.0858	1.0137	1.1547	1.0873
0.4115	0.7125	0.7048	0.7148	0.7065	1.2240	1.1609	1.2928	1.2214
0.5371	0.7611	0.7595	0.7557	0.7517	1.3412	1.2826	1.3960	1.3239
0.6894	0.8200	0.8228	0.8080	0.8078	1.4530	1.4121	1.5013	1.4275
0.8510	0.8920	0.9018	0.8856	0.8872	1.5372	1.5388	1.5962	1.5205
0.9260	0.9384	0.9472	0.9362	0.9375	1.5652	1.5926	1.6275	1.5523
1.0000	1.0000	1.0000	1.0000	1.0000	1.5700	1.5700	1.5700	1.5700
$\overline{\Delta y}$		0.0197	0.0104	0.0057	%AAD	5.376	4.562	0.896

Table 4.48 (Continued)

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRE LATIVE	Exptl	UNIFAC	M-UNIFAC	CORRE LATIVE
T=313.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.5300	0.5300	0.5300	0.5300
0.0260	0.1673	0.1441	0.1802	0.1669	0.6488	0.6294	0.6667	0.6404
0.0566	0.2955	0.2635	0.3145	0.2959	0.7672	0.7278	0.7992	0.7570
0.2259	0.5729	0.5596	0.5949	0.5809	1.2016	1.1515	1.3172	1.2220
0.2846	0.6216	0.6086	0.6346	0.6233	1.3296	1.2613	1.4342	1.3302
0.3298	0.6449	0.6392	0.6584	0.6493	1.3958	1.3367	1.5096	1.4014
0.3947	0.6820	0.6763	0.6868	0.6802	1.4790	1.4338	1.6017	1.4888
0.5387	0.7476	0.7442	0.7393	0.7374	1.6742	1.6179	1.7651	1.6459
0.6191	0.7774	0.7797	0.7687	0.7687	1.7590	1.7102	1.8440	1.7212
0.7690	0.8469	0.8511	0.8349	0.8369	1.9006	1.8725	1.9777	1.8480
0.8983	0.9539	0.9264	-	0.9161	1.9934	2.0024	-	1.9355
0.9314	0.9722	0.9487	-	0.9408	2.0008	2.0330	-	1.9520
1.0000	1.0000	1.0000	1.0000	1.0000	2.0030	2.0030	2.0030	2.0030
$\overline{\Delta y}$		0.0140	0.0127	0.0104	%AAD	3.128	6.132	1.579

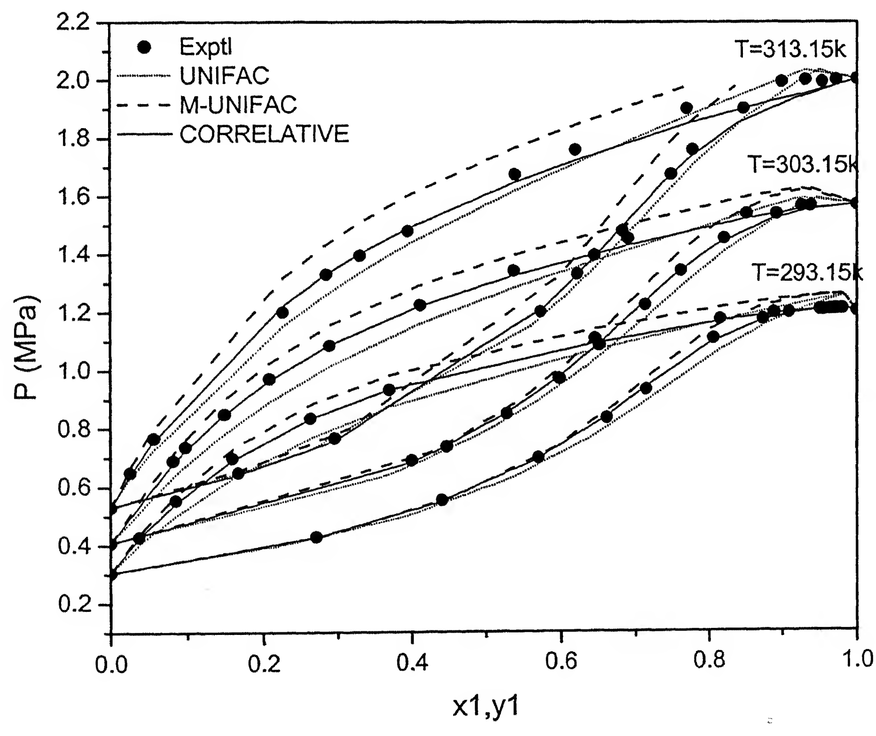

Figure 4.46 P-x-y diagram for R125 (1)/R600a (2) system using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

Table 4.49 Results of VLE Calculations for R125 (1) / R600a (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=293.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.3045	0.3045	0.3045	0.3045
0.0379	0.2714	0.2302	0.2870	0.2642	0.4279	0.3844	0.4172	0.4240
0.0848	0.4411	0.3921	0.4574	0.4310	0.5529	0.4774	0.5419	0.5409
0.1590	0.5697	0.5342	0.5879	0.5648	0.6988	0.6009	0.6959	0.6877
0.2634	0.6608	0.6406	0.6746	0.6573	0.8354	0.7351	0.8448	0.8337
0.3693	0.7138	0.7051	0.7224	0.7100	0.9333	0.8377	0.9430	0.9339
0.6454	0.8056	0.8164	0.8040	0.8011	1.1092	1.0255	1.0954	1.0950
0.8146	0.8736	0.8877	0.8692	0.8698	1.1750	1.1198	1.1657	1.1687
0.8884	0.9092	0.9264	0.9105	0.9117	1.1982	1.1580	1.1899	1.1944
0.9507	0.9563	0.9647	0.9554	0.9563	1.2067	1.1878	1.2036	1.2097
0.9647	0.9676	0.9743	0.9671	0.9679	1.2093	1.1940	1.2054	1.2120
0.9707	0.9727	0.9785	0.9724	0.9730	1.2102	1.1966	1.2060	1.2129
0.9716	0.9734	0.9791	0.9731	0.9738	1.2108	1.1970	1.2061	1.2130
0.9807	0.9797	0.9856	0.9814	0.9819	1.2106	1.2009	1.2067	1.2140
1.0000	1.0000	1.0000	1.0000	1.0000	1.2036	1.2036	1.2036	1.2036
$\overline{\Delta y}$		0.0176	0.0064	0.0034	%AAD	6.275	0.878	0.635
T=303.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.4070	0.4070	0.4070	0.4070
0.0816	0.3998	0.3598	0.4189	0.3943	0.6900	0.6120	0.6869	0.6782
0.0977	0.4474	0.3994	0.4580	0.4334	0.7376	0.6484	0.7341	0.7219
0.1492	0.5277	0.4952	0.5468	0.5241	0.8492	0.7551	0.8663	0.8460
0.2085	0.5977	0.5693	0.6105	0.5910	0.9714	0.8609	0.9891	0.9632
0.2889	0.6515	0.6377	0.6653	0.6498	1.0858	0.9807	1.1164	1.0871
0.4115	0.7125	0.7079	0.7180	0.7077	1.2240	1.1249	1.2523	1.2234
0.5371	0.7611	0.7624	0.7587	0.7528	1.3412	1.2432	1.3526	1.3264
0.6894	0.8200	0.8246	0.8099	0.8081	1.4530	1.3676	1.4533	1.4294
0.8510	0.8920	0.9024	0.8860	0.8867	1.5372	1.4887	1.5436	1.5209
0.9260	0.9384	0.9473	0.9360	0.9369	1.5652	1.5399	1.5730	1.5516
1.0000	1.0000	1.0000	1.0000	1.0000	1.5700	1.5700	1.5700	1.5700
$\overline{\Delta y}$		0.0193	0.0102	0.0063	%AAD	8.158	1.168	0.990

Table 4.49 (Continued)

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=313.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.5300	0.5300	0.5300	0.5300
0.0260	0.1673	0.1436	0.1788	0.1643	0.6488	0.6116	0.6475	0.6402
0.0566	0.2955	0.2633	0.3132	0.2927	0.7672	0.7068	0.7752	0.7553
0.2259	0.5729	0.5624	0.5973	0.5803	1.2016	1.1218	1.2820	1.2206
0.2846	0.6216	0.6119	0.6376	0.6235	1.3296	1.2303	1.3978	1.3304
0.3298	0.6449	0.6427	0.6619	0.6497	1.3958	1.3047	1.4728	1.4022
0.3947	0.6820	0.6800	0.6905	0.6810	1.4790	1.4006	1.5641	1.4910
0.5387	0.7476	0.7476	0.7428	0.7383	1.6742	1.5815	1.7246	1.6489
0.6191	0.7774	0.7825	0.7717	0.7692	1.7590	1.6715	1.8012	1.7238
0.7690	0.8469	0.8526	0.8364	0.8366	1.9006	1.8290	1.9307	1.8492
0.8983	0.9539	0.9268	0.9145	0.9155	1.9934	1.9547	2.0185	1.9346
0.9314	0.9722	0.9489	0.9395	0.9403	2.0008	1.9842	2.0340	1.9502
1.0000	1.0000	1.0000	1.0000	1.0000	2.0030	2.0030	2.0030	2.0030
$\overline{\Delta y}$		0.0129	0.0171	0.0108	%AAD	5.145	3.114	1.591

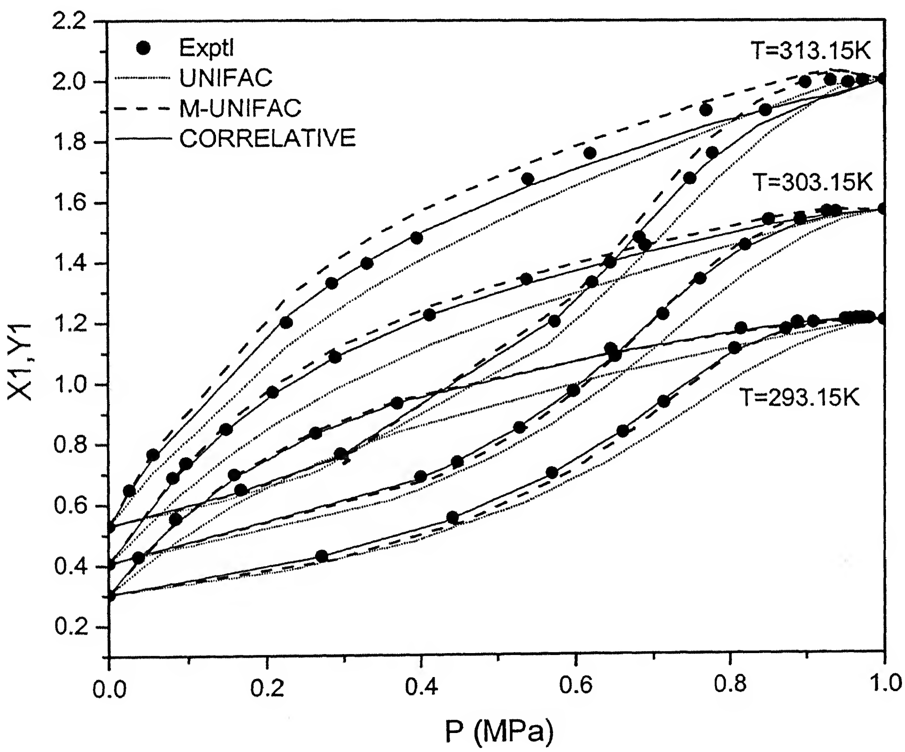

Figure 4.47 P-x-y diagram for R125 (1) / R600a (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

Table 4.50 Results of VLE Calculations for R125 (1) / R600a (2) System using Pure components as ref. fluids

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=293.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.3045	0.3045	0.3045	0.3045
0.0379	0.2714	0.2284	0.2862	0.2616	0.4279	0.3840	0.4170	0.4230
0.0848	0.4411	0.3902	0.4566	0.4282	0.5529	0.4763	0.5414	0.5386
0.1590	0.5697	0.5325	0.5875	0.5627	0.6988	0.5992	0.6954	0.6845
0.2634	0.6608	0.6396	0.6745	0.6561	0.8354	0.7332	0.8445	0.8305
0.3693	0.7138	0.7047	0.7224	0.7094	0.9333	0.8359	0.9428	0.9310
0.6454	0.8056	0.8167	0.8040	0.8016	1.1092	1.0247	1.0951	1.0937
0.8146	0.8736	0.8881	-	-	1.1750	1.1195	-	-
1.0000	1.0000	1.0000	1.0000	1.0000	1.2036	1.2036	1.2036	1.2036
$\overline{\Delta y}$		0.0267	0.0120	0.0062	%AAD	10.485	1.418	1.195
T=303.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.4070	0.4070	0.4070	0.4070
0.0816	0.3998	0.3577	0.4186	0.3911	0.6900	0.6110	0.6866	0.6763
0.0977	0.4474	0.3975	0.4577	0.4303	0.7376	0.6474	0.7336	0.7197
0.1492	0.5277	0.4934	0.5467	0.5214	0.8492	0.7535	0.8661	0.8430
0.2085	0.5977	0.5678	0.6105	0.5887	0.9714	0.8589	0.9889	0.9594
0.2889	0.6515	0.6366	0.6653	0.6482	1.0858	0.9784	1.1162	1.0833
0.4115	0.7125	0.7073	-	-	1.2240	1.1227	-	-
1.0000	1.0000	1.0000	1.0000	1.0000	1.5700	1.5700	1.5700	1.5700
$\overline{\Delta y}$		0.0294	0.0149	0.0089	%AAD	10.783	1.525	1.322
T=313.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.5300	0.5300	0.5300	0.5300
0.0260	0.1673	0.1423	0.1787	0.1619	0.6488	0.6131	0.6474	0.6426
0.0566	0.2955	0.2614	0.3131	0.2893	0.7672	0.7077	0.7750	0.7564
0.2259	0.5729	0.5606	-	0.5775	1.2016	1.1206	-	1.2186
0.2846	0.6216	0.6104	-	-	1.3296	1.2288	-	-
1.0000	1.0000	1.0000	1.0000	1.0000	2.0030	2.0030	2.0030	2.0030
$\overline{\Delta y}$		0.0207	0.0145	0.0054	%AAD	6.897	0.613	1.259

Table 4.51 Results of VLE Calculations for R134a (1) / R12 (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

x_1	y_1				P (MPa)			
Exptl	Exptl	Calculated			Exptl	Calculated		
		UNIFAC	M-UNIFAC	CORRELATIVE		UNIFAC	M-UNIFAC	CORRELATIVE
T=258K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.1815	0.1815	0.1815	0.1815
0.1222	0.2152	0.1231	0.1175	0.1982	0.2079	0.1980	0.1953	0.2068
0.2451	0.3221	0.2364	0.2306	0.3203	0.2197	0.1975	0.1938	0.2185
0.3213	0.3747	0.3032	0.2990	0.3757	0.2231	0.1966	0.1924	0.2223
0.4893	0.4638	0.4466	0.4492	0.4716	0.2244	0.1928	0.1884	0.2244
0.5476	0.5005	0.4967	0.5020	0.5015	0.2232	0.1908	0.1865	0.2235
0.6515	0.5594	0.5892	0.5992	0.5567	0.2186	0.1866	0.1827	0.2198
0.7623	0.6421	0.6967	0.7102	0.6289	0.2099	0.1806	0.1777	0.2117
0.8680	0.7542	0.8146	0.8276	0.7319	0.1948	0.1732	0.1719	0.1973
1.0000	1.0000	1.0000	1.0000	1.0000	0.1631	0.1631	0.1631	0.1631
$\overline{\Delta y}$		0.0519	0.0578	0.0084	%AAD	11.880	13.453	0.527
T=278K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.3602	0.3602	0.3602	0.3602
0.1205	0.2113	0.1290	0.1237	0.1943	0.4089	0.3896	0.3838	0.4077
0.2387	0.3196	0.2442	0.2386	0.3173	0.4345	0.3923	0.3845	0.4322
0.3153	0.3738	0.3148	0.3107	0.3779	0.4434	0.3927	0.3842	0.4416
0.4892	0.4838	0.4688	0.4707	0.4879	0.4495	0.3900	0.3809	0.4493
0.5496	0.5195	0.5220	0.5264	0.5225	0.4479	0.3877	0.3790	0.4483
0.6571	0.5891	0.6187	0.6272	0.5864	0.4402	0.3821	0.3743	0.4419
0.7683	0.6749	0.7256	0.7366	0.6653	0.4247	0.3736	0.3677	0.4273
0.8704	0.7847	0.8347	0.8449	0.7665	0.3991	0.3630	0.3599	0.4025
1.0000	1.0000	1.0000	1.0000	1.0000	0.3485	0.3485	0.3485	0.3485
$\overline{\Delta y}$		0.0456	0.0515	0.0076	%AAD	10.855	12.482	0.402
T=298K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.6477	0.6477	0.6477	0.6477
0.1097	0.1872	0.1228	0.1183	0.1762	0.7262	0.6957	0.6846	0.7230
0.2190	0.3020	0.2348	0.2295	0.2978	0.7724	0.7056	0.6911	0.7689
0.2984	0.3683	0.3113	0.3071	0.3668	0.7936	0.7105	0.6944	0.7908
0.4879	0.4932	0.4845	0.4858	0.4987	0.8132	0.7141	0.6969	0.8136
0.5514	0.5340	0.5413	0.5449	0.5387	0.8118	0.7128	0.6960	0.8135
0.6573	0.6085	0.6373	0.6443	0.6075	0.8019	0.7076	0.6926	0.8047
0.7726	0.7035	0.7469	0.7558	0.6944	0.7765	0.6973	0.6858	0.7804
0.8844	0.8204	0.8628	0.8704	0.8085	0.7330	0.6820	0.6758	0.7353
1.0000	1.0000	1.0000	1.0000	1.0000	0.6622	0.6622	0.6622	0.6622
$\overline{\Delta y}$		0.0399	0.0449	0.0061	%AAD	9.580	11.304	0.333

Table 4.52 Results of VLE Calculations for R134a (1) / R12 (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

x_1	y_1				P (MPa)			
Exptl	Exptl	Calculated			Exptl	Calculated		
		UNIFAC	M-UNIFAC	CORRELATIVE		UNIFAC	M-UNIFAC	CORRELATIVE
T=258K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.1815	0.1815	0.1815	0.1815
0.1222	0.2152	0.1341	0.1280	0.2007	0.2079	0.1815	0.1789	0.2069
0.2451	0.3221	0.2541	0.2478	0.3214	0.2197	0.1832	0.1796	0.2187
0.3213	0.3747	0.3234	0.3190	0.3760	0.2231	0.1836	0.1797	0.2225
0.4893	0.4638	0.4695	0.4721	0.4706	0.2244	0.1827	0.1785	0.2245
0.5476	0.5005	0.5198	0.5251	0.5003	0.2232	0.1817	0.1777	0.2235
0.6515	0.5594	0.6116	0.6215	0.5562	0.2186	0.1793	0.1758	0.2197
0.7623	0.6421	0.7164	0.7294	0.6296	0.2099	0.1754	0.1728	0.2115
0.8680	0.7542	0.8290	0.8410	0.7336	0.1948	0.1702	0.1691	0.1971
1.0000	1.0000	1.0000	1.0000	1.0000	0.1631	0.1631	0.1631	0.1631
$\overline{\Delta y}$		0.0533	0.0608	0.0075	%AAD	16.412	17.870	0.487
T=278K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.3602	0.3602	0.3602	0.3602
0.1205	0.2113	0.1372	0.1316	0.1960	0.4089	0.3650	0.3595	0.4079
0.2387	0.3196	0.2572	0.2512	0.3180	0.4345	0.3709	0.3634	0.4325
0.3153	0.3738	0.3296	0.3252	0.3779	0.4434	0.3733	0.3651	0.4419
0.4892	0.4838	0.4854	0.4874	0.4870	0.4495	0.3750	0.3664	0.4493
0.5496	0.5195	0.5384	0.5429	0.5217	0.4479	0.3743	0.3660	0.4483
0.6571	0.5891	0.6343	0.6427	0.5861	0.4402	0.3715	0.3642	0.4417
0.7683	0.6749	0.7390	0.7497	0.6661	0.4247	0.3661	0.3607	0.4269
0.8704	0.7847	0.8443	0.8539	0.7684	0.3991	0.3587	0.3559	0.4022
1.0000	1.0000	1.0000	1.0000	1.0000	0.3485	0.3485	0.3485	0.3485
$\overline{\Delta y}$		0.0463	0.0527	0.0068	%AAD	14.218	15.760	0.351
T=298K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.6477	0.6477	0.6477	0.6477
0.1097	0.1872	0.1283	0.1234	0.1774	0.7262	0.6629	0.6523	0.7232
0.2190	0.3020	0.2434	0.2380	0.2982	0.7724	0.6767	0.6627	0.7694
0.2984	0.3683	0.3214	0.3170	0.3666	0.7936	0.6843	0.6686	0.7911
0.4879	0.4932	0.4957	0.4972	0.4980	0.8132	0.6943	0.6776	0.8134
0.5514	0.5340	0.5526	0.5562	0.5382	0.8118	0.6951	0.6790	0.8132
0.6573	0.6085	0.6479	0.6548	0.6075	0.8019	0.6937	0.6793	0.8043
0.7726	0.7035	0.7557	0.7644	0.6956	0.7765	0.6877	0.6768	0.7799
0.8844	0.8204	0.8685	0.8758	0.8103	0.7330	0.6771	0.6712	0.7351
1.0000	1.0000	1.0000	1.0000	1.0000	0.6622	0.6622	0.6622	0.6622
$\overline{\Delta y}$		0.0407	0.0460	0.0054	%AAD	12.055	13.716	0.292

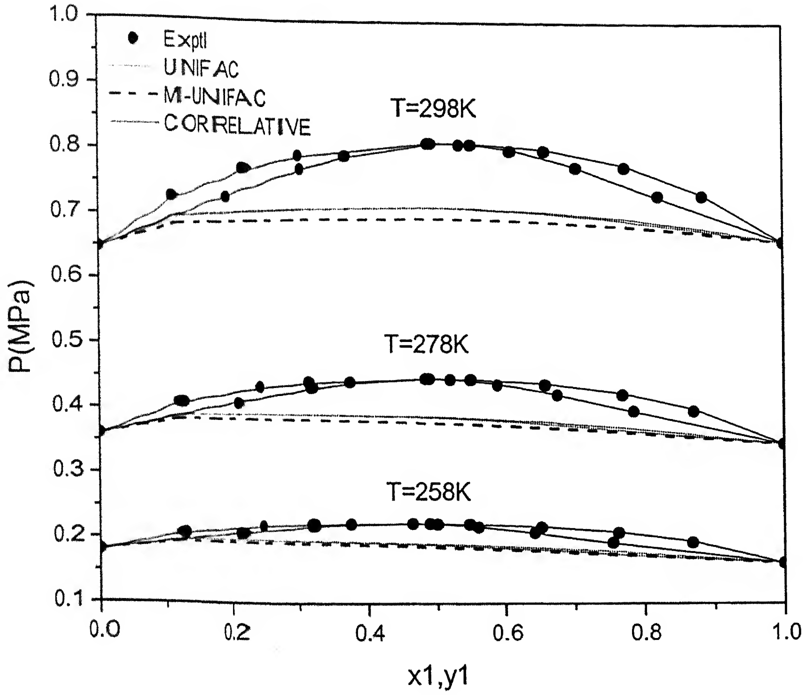

Figure 4.48 P–x-y diagram for R134a (1)/R12 (2) system using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

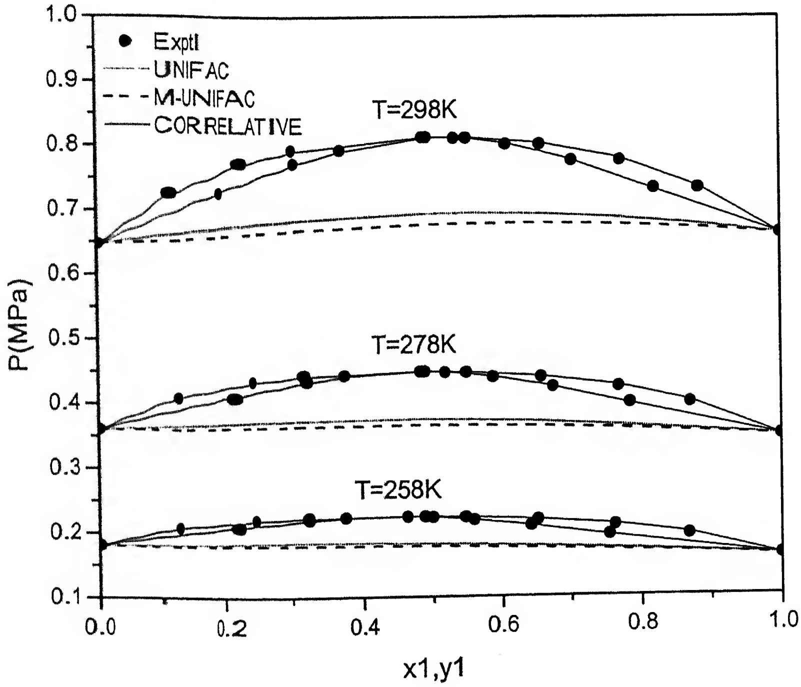

Figure 4.49 P–x-y diagram for R134a (1) / R12 (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

Table 4.53 Results of VLE Calculations for R134a (1) / R12 (2) System using Pure components as ref. fluids

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=258K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.1815	0.1815	0.1815	0.1815
0.1222	0.2152	0.1347	0.1285	0.2017	0.2079	0.1809	0.1783	0.2069
0.2451	0.3221	0.2548	0.2485	0.3219	0.2197	0.1828	0.1792	0.2187
0.3213	0.3747	0.3242	0.3197	0.3763	0.2231	0.1832	0.1793	0.2225
0.4893	0.4638	0.4703	0.4728	0.4704	0.2244	0.1823	0.1782	0.2245
0.5476	0.5005	0.5204	0.5258	0.5002	0.2232	0.1814	0.1775	0.2236
0.6515	0.5594	0.6122	0.6221	0.5559	0.2186	0.1790	0.1755	0.2198
0.7623	0.6421	0.7170	0.7299	0.6295	0.2099	0.1752	0.1727	0.2115
0.8680	0.7542	0.8295	0.8414	0.7339	0.1948	0.1701	0.1690	0.1971
1.0000	1.0000	1.0000	1.0000	1.0000	0.1631	0.1631	0.1631	0.1631
$\overline{\Delta y}$		0.0535	0.0609	0.0073	%AAD	16.556	18.009	0.484
T=278K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.3602	0.3602	0.3602	0.3602
0.1205	0.2113	0.1369	0.1313	0.1963	0.4089	0.3660	0.3604	0.4080
0.2387	0.3196	0.2567	0.2507	0.3180	0.4345	0.3718	0.3643	0.4327
0.3153	0.3738	0.3290	0.3246	0.3776	0.4434	0.3741	0.3659	0.4419
0.4892	0.4838	0.4845	0.4866	0.4867	0.4495	0.3756	0.3670	0.4494
0.5496	0.5195	0.5377	0.5422	0.5214	0.4479	0.3748	0.3665	0.4483
0.6571	0.5891	0.6338	0.6421	0.5859	0.4402	0.3719	0.3646	0.4417
0.7683	0.6749	0.7385	0.7492	0.6661	0.4247	0.3664	0.3610	0.4268
0.8704	0.7847	0.8440	0.8536	0.7686	0.3991	0.3588	0.3560	0.4021
1.0000	1.0000	1.0000	1.0000	1.0000	0.3485	0.3485	0.3485	0.3485
$\overline{\Delta y}$		0.0461	0.0525	0.0067	%AAD	14.083	15.629	0.333
T=298K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.6477	0.6477	0.6477	0.6477
0.1097	0.1872	0.1276	0.1228	0.1774	0.7262	0.6670	0.6564	0.7233
0.2190	0.3020	0.2423	0.2368	0.2981	0.7724	0.6804	0.6663	0.7693
0.2984	0.3683	0.3200	0.3157	0.3665	0.7936	0.6876	0.6719	0.7910
0.4879	0.4932	0.4942	0.4956	0.4980	0.8132	0.6967	0.6800	0.8133
0.5514	0.5340	0.5511	0.5547	0.5382	0.8118	0.6973	0.6811	0.8130
0.6573	0.6085	0.6465	0.6534	0.6078	0.8019	0.6953	0.6809	0.8041
0.7726	0.7035	0.7547	0.7634	0.6959	0.7765	0.6889	0.6779	0.7798
0.8844	0.8204	0.8680	0.8753	0.8108	0.7330	0.6778	0.6718	0.7352
1.0000	1.0000	1.0000	1.0000	1.0000	0.6622	0.6622	0.6622	0.6622
$\overline{\Delta y}$		0.0403	0.0456	0.0053	%AAD	11.745	13.413	0.288

Table 4.54 Results of VLE Calculations for R134a (1) / R124 (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

x_1	y_1				P (MPa)			
Exptl	Exptl	Calculated			Exptl	Calculated		
		UNIFAC	M-UNIFAC	CORRELATIVE		UNIFAC	M-UNIFAC	CORRELATIVE
T=296.45K								
0.000	0.000	0.0000	0.0000	0.0000	0.370	0.370	0.370	0.370
0.193	0.297	0.2335	0.2635	0.3001	0.421	0.422	0.441	0.422
0.409	0.542	0.4920	0.5085	0.5361	0.485	0.458	0.491	0.485
0.558	0.663	0.6536	0.6535	0.6671	0.527	0.492	0.526	0.523
0.755	0.835	0.8341	0.8212	0.8204	0.572	0.545	0.573	0.569
1.000	1.000	1.0000	1.0000	1.0000	0.621	0.621	0.621	0.621
$\overline{\Delta y}$		0.0310	0.0226	0.0069	%AAD	4.309	1.623	0.374
T=302.25K								
0.000	0.000	0.0000	0.0000	0.0000	0.431	0.431	0.431	0.431
0.102	0.171	0.1231	0.1446	0.1713	0.473	0.487	0.498	0.474
0.180	0.286	0.2187	0.2461	0.2806	0.506	0.498	0.520	0.504
0.237	0.354	0.2885	0.3160	0.3515	0.526	0.508	0.535	0.525
0.368	0.488	0.4452	0.4638	0.4936	0.572	0.535	0.571	0.571
0.678	0.766	0.7677	0.7571	0.7607	0.667	0.622	0.658	0.666
0.761	0.825	0.8381	0.8248	0.8237	0.688	0.651	0.682	0.689
0.865	0.901	0.9158	0.9044	0.9007	0.716	0.689	0.712	0.716
1.000	1.000	1.0000	1.0000	1.0000	0.748	0.748	0.748	0.748
$\overline{\Delta y}$		0.0362	0.0201	0.0030	%AAD	4.320	1.807	0.143
T=307.25K								
0.000	0.000	0.0000	0.0000	0.0000	0.498	0.498	0.498	0.498
0.071	0.122	0.0858	0.1016	0.1218	0.536	0.555	0.564	0.533
0.161	0.256	0.1961	0.2211	0.2531	0.569	0.570	0.592	0.574
0.266	0.387	0.3244	0.3488	0.3824	0.622	0.592	0.625	0.619
0.486	0.605	0.5776	0.5823	0.6011	0.707	0.652	0.696	0.703
0.711	0.793	0.7956	0.7833	0.7846	0.779	0.732	0.770	0.780
0.937	0.955	0.9626	0.9560	0.9533	0.852	0.830	0.845	0.848
1.000	1.000	1.0000	1.0000	1.0000	0.865	0.865	0.865	0.865
$\overline{\Delta y}$		0.0327	0.0212	0.0036	%AAD	4.165	2.239	0.514

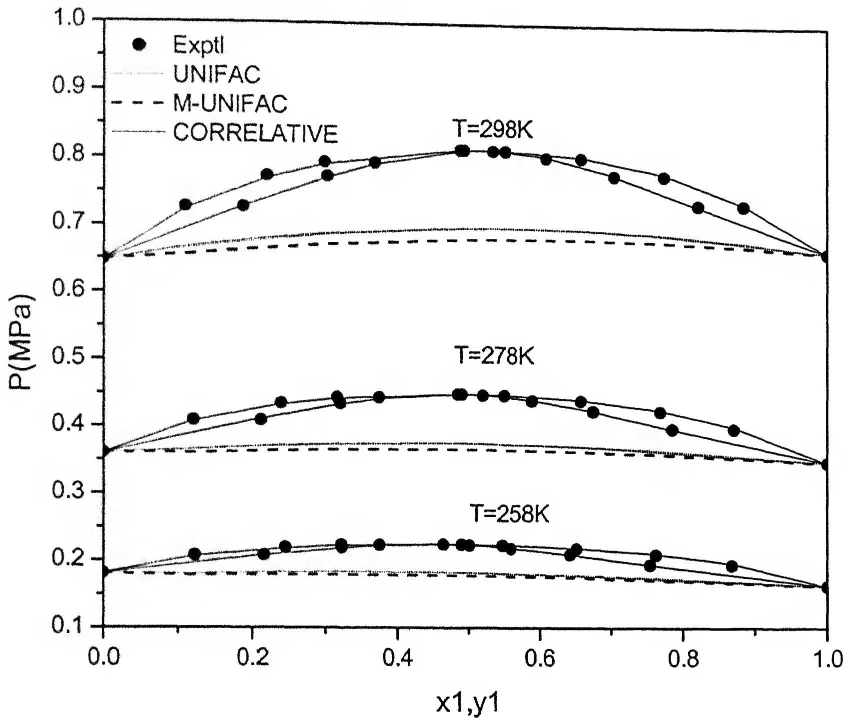

Figure 4.50 P-x-y diagram for R134a (1) / R12 (2) System using pure components as ref. fluids

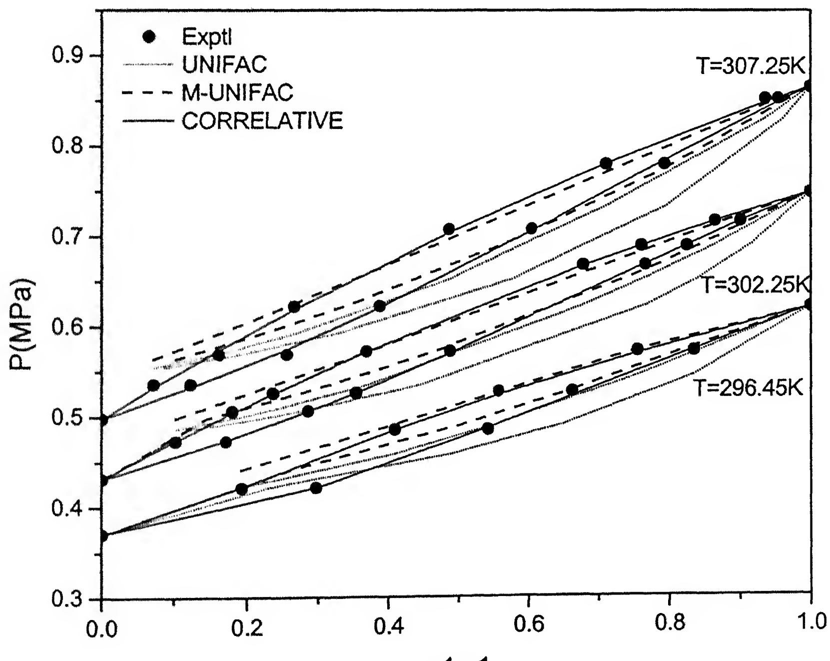

Figure 4.51 P-x-y diagram for R134a (1)/R124 (2) system using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

Table 4.55 Results of VLE Calculations for R134a (1) / R124 (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=296.45K								
0.000	0.000	0.0000	0.0000	0.0000	0.370	0.370	0.370	0.370
0.193	0.297	0.2481	0.2800	0.3008	0.421	0.394	0.413	0.422
0.409	0.542	0.5124	0.5290	0.5361	0.485	0.438	0.470	0.485
0.558	0.663	0.6719	0.6716	0.6671	0.527	0.477	0.510	0.523
0.755	0.835	0.8448	0.8327	0.8206	0.572	0.537	0.564	0.569
1.000	1.000	1.0000	1.0000	1.0000	0.621	0.621	0.621	0.621
$\overline{\Delta y}$		0.0243	0.0102	0.0071	%AAD	7.970	2.416	0.380
T=302.25K								
0.000	0.000	0.0000	0.0000	0.0000	0.431	0.431	0.431	0.431
0.102	0.171	0.1309	0.1542	0.1720	0.473	0.452	0.464	0.474
0.180	0.286	0.2313	0.2603	0.2811	0.506	0.467	0.488	0.504
0.237	0.354	0.3035	0.3323	0.3518	0.526	0.479	0.506	0.526
0.368	0.488	0.4635	0.4822	0.4934	0.572	0.511	0.546	0.571
0.678	0.766	0.7805	0.7702	0.7606	0.667	0.611	0.645	0.666
0.761	0.825	0.8476	0.8350	0.8239	0.688	0.642	0.672	0.689
0.865	0.901	0.9211	0.9104	0.9010	0.716	0.684	0.706	0.716
1.000	1.000	1.0000	1.0000	1.0000	0.748	0.748	0.748	0.748
$\overline{\Delta y}$		0.0324	0.0134	0.0029	%AAD	7.349	2.962	0.134
T=307.25K								
0.000	0.000	0.0000	0.0000	0.0000	0.498	0.498	0.498	0.498
0.071	0.122	0.0909	0.1081	0.1222	0.536	0.517	0.526	0.533
0.161	0.256	0.2067	0.2331	0.2535	0.569	0.536	0.558	0.574
0.266	0.387	0.3392	0.3642	0.3826	0.622	0.562	0.595	0.619
0.486	0.605	0.5940	0.5983	0.6007	0.707	0.631	0.674	0.703
0.711	0.793	0.8061	0.7942	0.7847	0.779	0.721	0.757	0.780
0.937	0.955	0.9648	0.9587	0.9535	0.852	0.827	0.842	0.848
1.000	1.000	1.0000	1.0000	1.0000	0.865	0.865	0.865	0.865
$\overline{\Delta y}$		0.0270	0.0119	0.0035	%AAD	6.695	2.801	0.509

Table 4.56 Results of VLE Calculations for R134a (1) / R124 (2) System using Pure components as ref. fluids

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=296.45K								
0.000	0.000	0.0000	0.0000	0.0000	0.370	0.370	0.370	0.370
0.193	0.297	0.2479	0.2799	0.3009	0.421	0.394	0.413	0.422
0.409	0.542	0.5121	0.5287	0.5361	0.485	0.438	0.470	0.485
0.558	0.663	0.6717	0.6714	0.6669	0.527	0.477	0.510	0.523
0.755	0.835	0.8447	0.8326	0.8206	0.572	0.537	0.564	0.569
1.000	1.000	1.0000	1.0000	1.0000	0.621	0.621	0.621	0.621
$\overline{\Delta y}$		0.0243	0.0103	0.0070	%AAD	7.918	2.362	0.383
T=302.25K								
0.000	0.000	0.0000	0.0000	0.0000	0.431	0.431	0.431	0.431
0.102	0.171	0.1307	0.1540	0.1720	0.473	0.453	0.465	0.474
0.180	0.286	0.2310	0.2601	0.2811	0.506	0.467	0.488	0.504
0.237	0.354	0.3034	0.3321	0.3518	0.526	0.479	0.506	0.526
0.368	0.488	0.4632	0.4819	0.4934	0.572	0.511	0.547	0.571
0.678	0.766	0.7802	0.7700	0.7606	0.667	0.611	0.645	0.666
0.761	0.825	0.8474	0.8349	0.8239	0.688	0.642	0.672	0.689
0.865	0.901	0.9210	0.9104	0.9010	0.716	0.684	0.707	0.716
1.000	1.000	1.0000	1.0000	1.0000	0.748	0.748	0.748	0.748
$\overline{\Delta y}$		0.0325	0.0134	0.0029	%AAD	7.288	2.898	0.134
T=307.25K								
0.000	0.000	0.0000	0.0000	0.0000	0.498	0.498	0.498	0.498
0.071	0.122	0.0908	0.1080	0.1223	0.536	0.518	0.527	0.533
0.161	0.256	0.2064	0.2329	0.2535	0.569	0.536	0.558	0.574
0.266	0.387	0.3388	0.3641	0.3825	0.622	0.562	0.595	0.619
0.486	0.605	0.5937	0.5980	0.6007	0.707	0.631	0.674	0.703
0.711	0.793	0.8059	0.7940	0.7846	0.779	0.721	0.757	0.780
0.937	0.955	0.9647	0.9586	0.9535	0.852	0.827	0.843	0.848
1.000	1.000	1.0000	1.0000	1.0000	0.865	0.865	0.865	0.865
$\overline{\Delta y}$		0.0272	0.0120	0.0036	%AAD	6.626	2.729	0.508

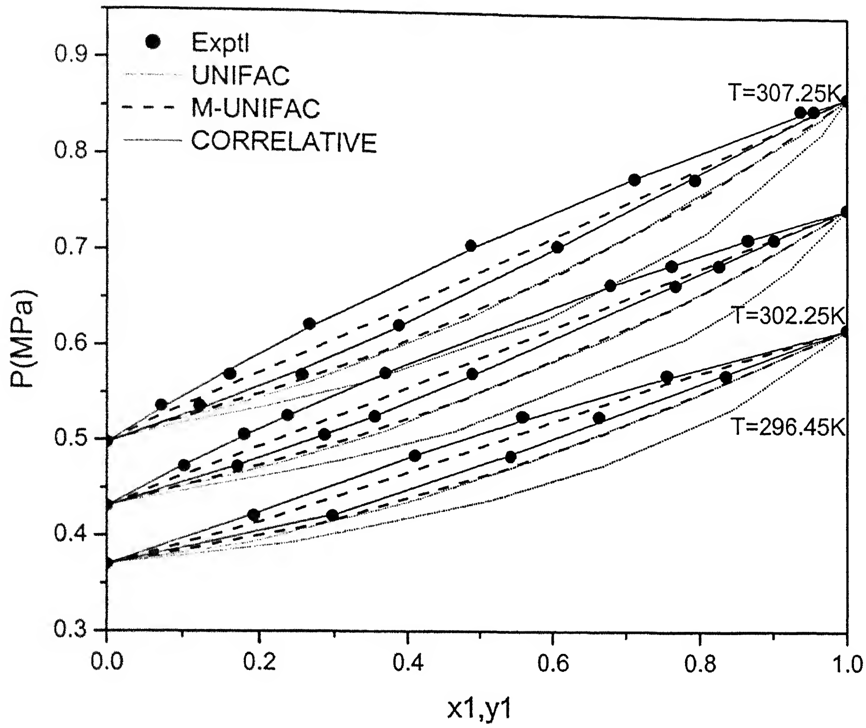

Figure 4.52 P-x-y diagram for R134a (1) / R124 (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

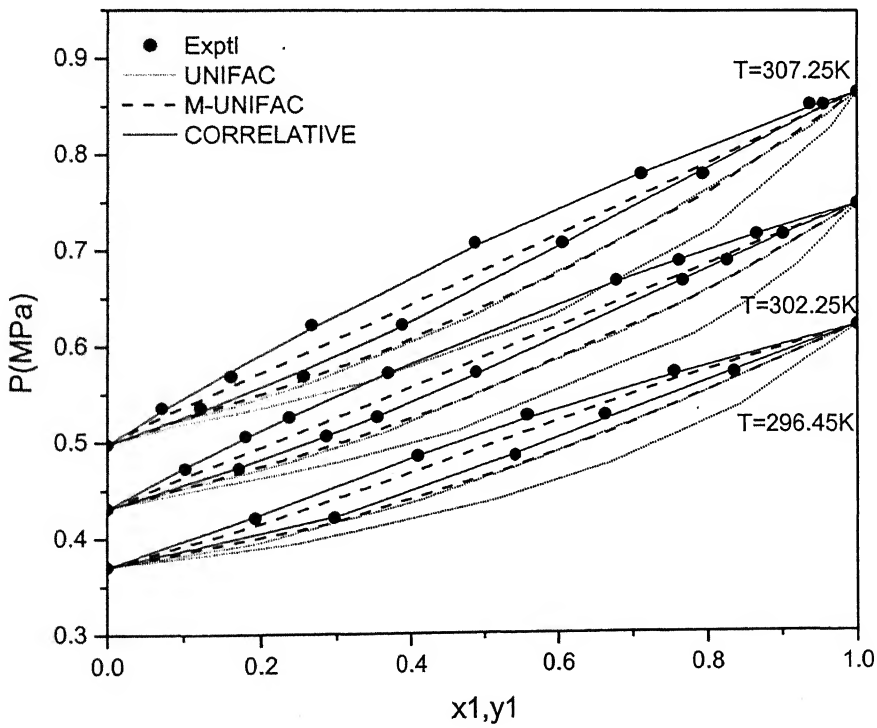

Figure 4.53 P-x-y diagram for R134a (1) / R124 (2) System using pure components as ref. fluids

Table 4.57 Results of VLE Calculations for R134a (1) / R142b (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=268K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.1189	0.1189	0.1189	0.1189
0.1820	0.3275	0.2925	0.3661	0.3385	0.1481	0.1333	0.1490	0.1495
0.2735	0.4448	0.4160	0.4776	0.4529	0.1620	0.1434	0.1639	0.1630
0.3737	0.5423	0.5353	0.5739	0.5555	0.1753	0.1550	0.1781	0.1764
0.4695	0.6359	0.6353	0.6504	0.6385	0.1874	0.1666	0.1902	0.1882
0.5720	0.7089	0.7286	0.7223	0.7169	0.1996	0.1794	0.2018	0.2000
0.7013	0.8045	0.8287	0.8055	0.8064	0.2132	0.1963	0.2150	0.2137
0.8371	0.8965	0.9158	0.8909	0.8947	0.2272	0.2146	0.2274	0.2272
0.9495	0.9664	0.9760	0.9648	0.9670	0.2373	0.2300	0.2366	0.2376
1.0000	1.0000	1.0000	1.0000	1.0000	0.2425	0.2425	0.2425	0.2425
$\overline{\Delta y}$		0.0180	0.0174	0.0059	%AAD	8.856	0.896	0.408
T=283K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.2066	0.2066	0.2066	0.2066
0.0877	0.1701	0.1457	0.2000	0.1805	0.2295	0.2146	0.2278	0.2308
0.1730	0.3061	0.2737	0.3394	0.3157	0.2516	0.2294	0.2539	0.2536
0.2677	0.4285	0.4009	0.4572	0.4358	0.2748	0.2468	0.2796	0.2768
0.3637	0.5262	0.5156	0.5523	0.5361	0.2962	0.2653	0.3026	0.2985
0.4669	0.6185	0.6240	0.6377	0.6279	0.3182	0.2860	0.3247	0.3200
0.5604	0.6998	0.7104	0.7061	0.7015	0.3371	0.3056	0.3429	0.3382
0.6918	0.7878	0.8153	0.7942	0.7955	0.3612	0.3342	0.3659	0.3621
0.8324	0.8902	0.9090	0.8855	0.8894	0.3861	0.3658	0.3880	0.3860
0.9514	0.9641	0.9757	0.9656	0.9677	0.4047	0.3933	0.4049	0.4051
1.0000	1.0000	1.0000	1.0000	1.0000	0.4132	0.4132	0.4132	0.4132
$\overline{\Delta y}$		0.0188	0.0173	0.0067	%AAD	7.886	1.242	0.458
T=298K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.3365	0.3365	0.3365	0.3365
0.0856	0.1583	0.1389	0.1858	0.1696	0.3699	0.3501	0.3697	0.3717
0.1700	0.2905	0.2632	0.3214	0.3013	0.4042	0.3732	0.4098	0.4067
0.2624	0.4103	0.3860	0.4369	0.4185	0.4389	0.3999	0.4490	0.4421
0.3533	0.5120	0.4946	0.5293	0.5151	0.4717	0.4274	0.4837	0.4746
0.4507	0.5999	0.5983	0.6135	0.6047	0.5052	0.4581	0.5174	0.5071
0.5563	0.6863	0.6977	0.6939	0.6906	0.5392	0.4928	0.5505	0.5402
0.6878	0.7843	0.8049	0.7855	0.7872	0.5784	0.5379	0.5878	0.5786
0.8239	0.8832	0.8991	0.8769	0.8809	0.6171	0.5865	0.6226	0.6160
0.9332	0.9554	0.9642	0.9520	0.9546	0.6440	0.6266	0.6480	0.6445
1.0000	1.0000	1.0000	1.0000	1.0000	0.6622	0.6622	0.6622	0.6622
$\overline{\Delta y}$		0.0163	0.0149	0.0054	%AAD	7.099	1.545	0.366

Table 4.58 Results of VLE Calculations for R134a (1) / R142b (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=268K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.1189	0.1189	0.1189	0.1189
0.1820	0.3275	0.2805	0.3521	0.3378	0.1481	0.1393	0.1549	0.1495
0.2735	0.4448	0.4020	0.4629	0.4527	0.1620	0.1487	0.1692	0.1629
0.3737	0.5423	0.5209	0.5595	0.5553	0.1753	0.1595	0.1829	0.1764
0.4695	0.6359	0.6218	0.6372	0.6386	0.1874	0.1704	0.1945	0.1882
0.5720	0.7089	0.7170	0.7108	0.7171	0.1996	0.1825	0.2055	0.2000
0.7013	0.8045	0.8203	0.7964	0.8065	0.2132	0.1984	0.2177	0.2138
0.8371	0.8965	0.9112	0.8851	0.8946	0.2272	0.2157	0.2290	0.2272
0.9495	0.9664	0.9746	0.9626	0.9669	0.2373	0.2303	0.2371	0.2376
1.0000	1.0000	1.0000	1.0000	1.0000	0.2425	0.2425	0.2425	0.2425
$\overline{\Delta y}$		0.0215	0.0108	0.0058	%AAD	6.971	2.880	0.400
T=283K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.2066	0.2066	0.2066	0.2066
0.0877	0.1701	0.1399	0.1919	0.1801	0.2295	0.2240	0.2370	0.2308
0.1730	0.3061	0.2645	0.3285	0.3153	0.2516	0.2380	0.2624	0.2535
0.2677	0.4285	0.3898	0.4453	0.4356	0.2748	0.2544	0.2873	0.2767
0.3637	0.5262	0.5038	0.5408	0.5361	0.2962	0.2719	0.3096	0.2984
0.4669	0.6185	0.6130	0.6271	0.6281	0.3182	0.2916	0.3309	0.3200
0.5604	0.6998	0.7007	0.6965	0.7017	0.3371	0.3102	0.3482	0.3383
0.6918	0.7878	0.8082	0.7866	0.7955	0.3612	0.3374	0.3700	0.3622
0.8324	0.8902	0.9051	0.8806	0.8893	0.3861	0.3675	0.3904	0.3860
0.9514	0.9641	0.9745	0.9639	0.9676	0.4047	0.3938	0.4055	0.4050
1.0000	1.0000	1.0000	1.0000	1.0000	0.4132	0.4132	0.4132	0.4132
$\overline{\Delta y}$		0.0206	0.0109	0.0066	%AAD	5.990	3.076	0.451
T=298K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.3365	0.3365	0.3365	0.3365
0.0856	0.1583	0.1345	0.1797	0.1693	0.3699	0.3626	0.3822	0.3716
0.1700	0.2905	0.2561	0.3129	0.3010	0.4042	0.3847	0.4213	0.4066
0.2624	0.4103	0.3774	0.4276	0.4185	0.4389	0.4102	0.4596	0.4421
0.3533	0.5120	0.4853	0.5202	0.5153	0.4717	0.4364	0.4934	0.4746
0.4507	0.5999	0.5894	0.6051	0.6049	0.5052	0.4659	0.5260	0.5072
0.5563	0.6863	0.6899	0.6863	0.6907	0.5392	0.4992	0.5578	0.5402
0.6878	0.7843	0.7991	0.7793	0.7872	0.5784	0.5424	0.5933	0.5787
0.8239	0.8832	0.8957	0.8728	0.8808	0.6171	0.5890	0.6259	0.6160
0.9332	0.9554	0.9629	0.9502	0.9545	0.6440	0.6276	0.6492	0.6443
1.0000	1.0000	1.0000	1.0000	1.0000	0.6622	0.6622	0.6622	0.6622
$\overline{\Delta y}$		0.0185	0.0106	0.0054	%AAD	5.487	3.246	0.364

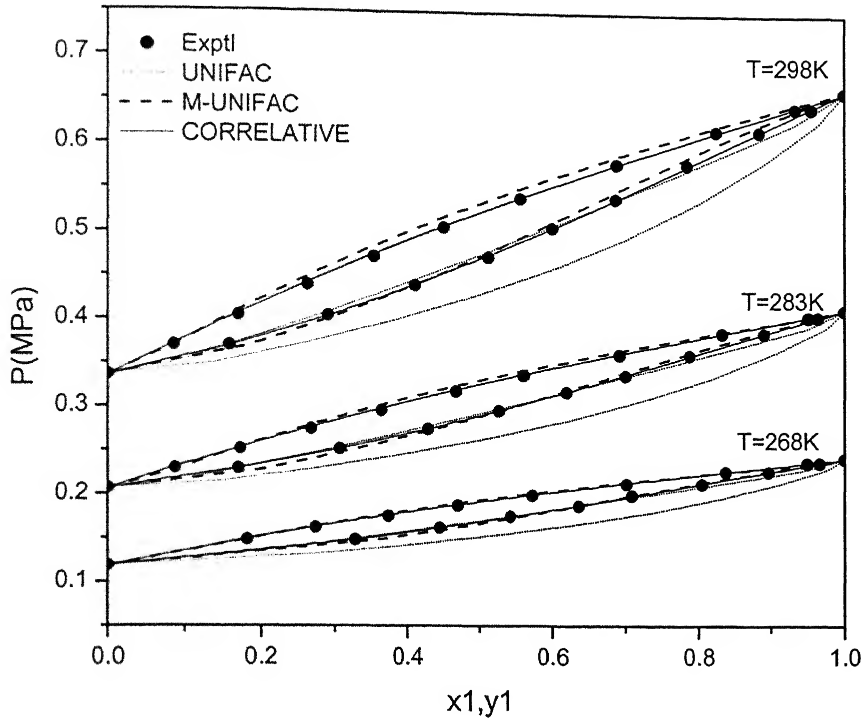

Figure 4.54 P-x-y diagram for R134a (1)/R142b (2) system using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

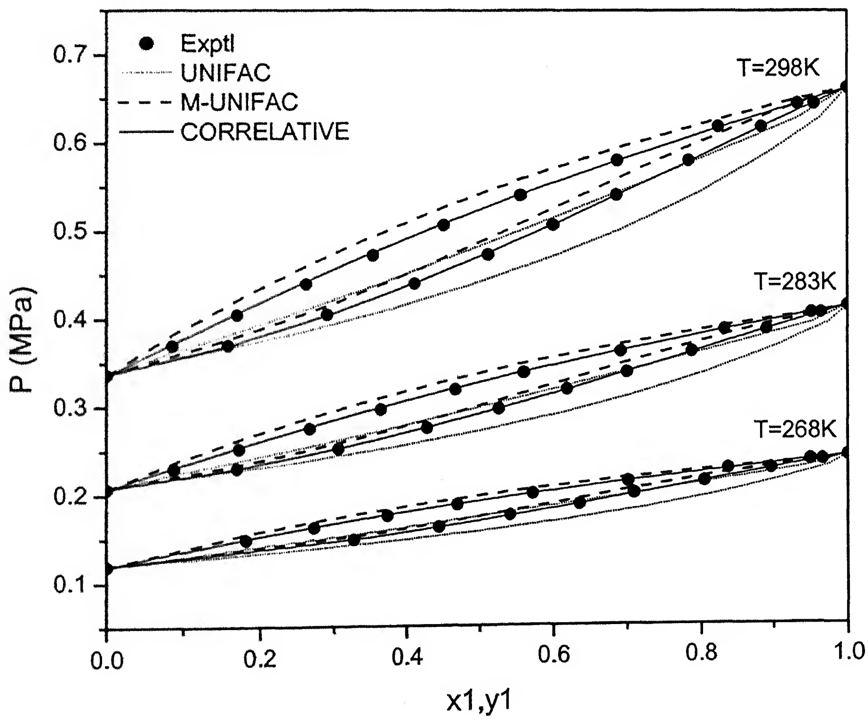

Figure 4.55 P-x-y diagram for R134a (1) / R142b (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

Table 4.59 Results of VLE Calculations for R134a (1) / R142b (2) System using Pure components as ref. fluids

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=268K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.1189	0.1189	0.1189	0.1189
0.1820	0.3275	0.2818	0.3538	0.3385	0.1481	0.1387	0.1544	0.1495
0.2735	0.4448	0.4034	0.4645	0.4531	0.1620	0.1482	0.1688	0.1630
0.3737	0.5423	0.5222	0.5610	0.5555	0.1753	0.1591	0.1825	0.1764
0.4695	0.6359	0.6230	0.6384	0.6387	0.1874	0.1701	0.1941	0.1883
0.5720	0.7089	0.7180	0.7116	0.7170	0.1996	0.1823	0.2051	0.2000
0.7013	0.8045	0.8210	0.7971	0.8064	0.2132	0.1983	0.2175	0.2138
0.8371	0.8965	0.9115	0.8855	0.8946	0.2272	0.2156	0.2288	0.2272
0.9495	0.9664	0.9747	0.9628	0.9669	0.2373	0.2303	0.2370	0.2376
1.0000	1.0000	1.0000	1.0000	1.0000	0.2425	0.2425	0.2425	0.2425
$\overline{\Delta y}$		0.0211	0.0115	0.0060	%AAD	7.132	2.720	0.413
T=283K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.2066	0.2066	0.2066	0.2066
0.0877	0.1701	0.1400	0.1923	0.1804	0.2295	0.2240	0.2371	0.2308
0.1730	0.3061	0.2645	0.3288	0.3156	0.2516	0.2380	0.2625	0.2536
0.2677	0.4285	0.3899	0.4456	0.4356	0.2748	0.2544	0.2874	0.2768
0.3637	0.5262	0.5039	0.5407	0.5360	0.2962	0.2719	0.3096	0.2985
0.4669	0.6185	0.6130	0.6271	0.6279	0.3182	0.2916	0.3309	0.3200
0.5604	0.6998	0.7007	0.6964	0.7016	0.3371	0.3102	0.3482	0.3383
0.6918	0.7878	0.8082	0.7866	0.7955	0.3612	0.3374	0.3699	0.3622
0.8324	0.8902	0.9051	0.8807	0.8893	0.3861	0.3675	0.3904	0.3860
0.9514	0.9641	0.9745	0.9639	0.9676	0.4047	0.3938	0.4056	0.4050
1.0000	1.0000	1.0000	1.0000	1.0000	0.4132	0.4132	0.4132	0.4132
$\overline{\Delta y}$		0.0205	0.0110	0.0067	%AAD	5.992	3.079	0.456
T=298K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.3365	0.3365	0.3365	0.3365
0.0856	0.1583	0.1340	0.1793	0.1693	0.3699	0.3637	0.3834	0.3717
0.1700	0.2905	0.2554	0.3121	0.3010	0.4042	0.3857	0.4223	0.4066
0.2624	0.4103	0.3765	0.4267	0.4183	0.4389	0.4111	0.4605	0.4421
0.3533	0.5120	0.4844	0.5191	0.5151	0.4717	0.4372	0.4941	0.4746
0.4507	0.5999	0.5885	0.6040	0.6047	0.5052	0.4665	0.5266	0.5071
0.5563	0.6863	0.6892	0.6855	0.6906	0.5392	0.4997	0.5583	0.5401
0.6878	0.7843	0.7986	0.7788	0.7873	0.5784	0.5428	0.5937	0.5786
0.8239	0.8832	0.8955	0.8726	0.8809	0.6171	0.5893	0.6263	0.6160
0.9332	0.9554	0.9629	0.9501	0.9546	0.6440	0.6278	0.6495	0.6445
1.0000	1.0000	1.0000	1.0000	1.0000	0.6622	0.6622	0.6622	0.6622
$\overline{\Delta y}$		0.0188	0.0107	0.0053	%AAD	5.341	3.396	0.359

Table 4.60 Results of VLE Calculations for R134a (1) / R152a (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

x_1	y_1				P (MPa)			
Exptl	Exptl	Calculated			Exptl	Calculated		
		UNIFAC	M-UNIFAC	CORRELATIVE		UNIFAC	M-UNIFAC	CORRELATIVE
T=255K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.1306	0.1306	0.1306	0.1306
0.3147	0.3298	0.4569	0.4312	0.3287	0.1328	0.1208	0.1345	0.1327
0.4489	0.4659	0.5686	0.5363	0.4697	0.1342	0.1285	0.1408	0.1342
0.5495	0.5737	0.6434	0.6080	0.5735	0.1354	0.1331	0.1440	0.1355
0.6580	0.6736	0.7213	0.6852	0.6830	0.1371	0.1371	0.1462	0.1372
0.7594	0.7777	0.7956	0.7626	0.7818	0.1389	0.1400	0.1470	0.1390
0.8843	0.8998	0.8947	0.8724	0.8982	0.1414	0.1424	0.1462	0.1414
1.0000	1.0000	1.0000	1.0000	1.0000	0.1438	0.1438	0.1438	0.1438
$\overline{\Delta y}$		0.0617	0.0434	0.0034	%AAD	2.745	4.730	0.044
T=275K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.2821	0.2821	0.2821	0.2821
0.3225	0.3329	0.4342	0.4159	0.3382	0.2883	0.2745	0.2993	0.2884
0.4483	0.4664	0.5422	0.5177	0.4697	0.2914	0.2883	0.3105	0.2916
0.5502	0.5748	0.6221	0.5945	0.5744	0.2946	0.2969	0.3166	0.2947
0.6648	0.6843	0.7098	0.6810	0.6892	0.2983	0.3045	0.3204	0.2986
0.7590	0.7782	0.7837	0.7568	0.7807	0.3023	0.3090	0.3213	0.3022
0.8874	0.8979	0.8920	0.8740	0.9003	0.3077	0.3125	0.3184	0.3076
1.0000	1.0000	1.0000	1.0000	1.0000	0.3129	0.3129	0.3129	0.3129
$\overline{\Delta y}$		0.0435	0.0338	0.0031	%AAD	2.079	5.831	0.043
T=298K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.5936	0.5936	0.5936	0.5936
0.3195	0.3365	0.4031	0.3919	0.3359	0.6084	0.6047	0.6456	0.6086
0.4460	0.4656	0.5151	0.4986	0.4675	0.6162	0.6299	0.6667	0.6161
0.5498	0.5686	0.6008	0.5811	0.5735	0.6233	0.6456	0.6778	0.6232
0.6626	0.6822	0.6925	0.6712	0.6860	0.6313	0.6580	0.6838	0.6318
0.7575	0.7744	0.7716	0.7512	0.7781	0.6394	0.6647	0.6839	0.6397
0.8828	0.8940	0.8831	0.8689	0.8953	0.6509	0.6682	0.6763	0.6509
0.9777	0.9789	0.9765	0.9730	0.9805	0.6597	0.6663	0.6636	0.6601
1.0000	1.0000	1.0000	1.0000	1.0000	0.6622	0.6622	0.6622	0.6622
$\overline{\Delta y}$		0.2500	0.0237	0.0025	%AAD	2.605	6.118	0.035

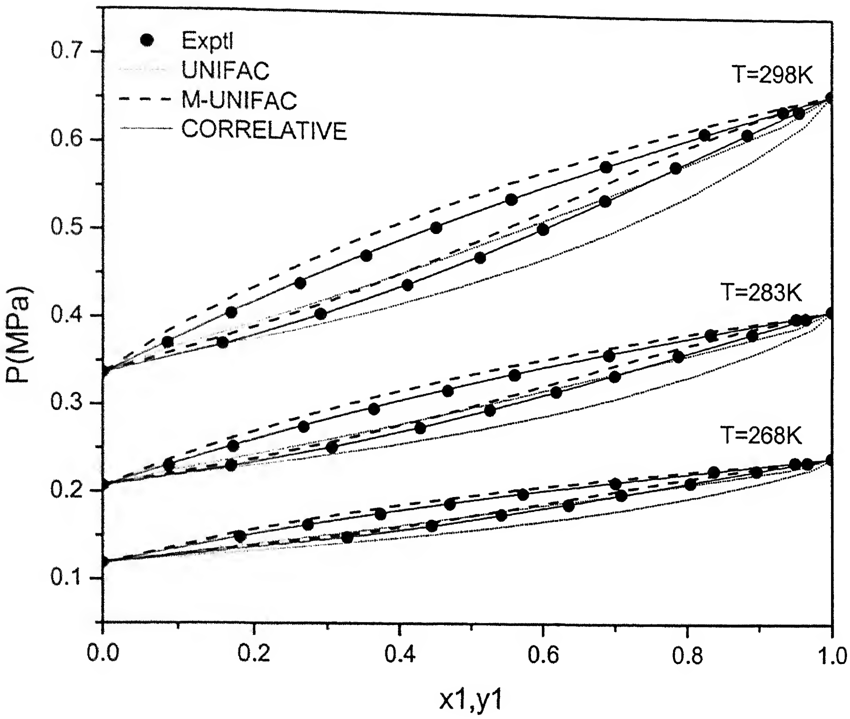

Figure 4.56 P-x-y diagram for R134a (1) / R142b (2) System using pure components as ref. fluids

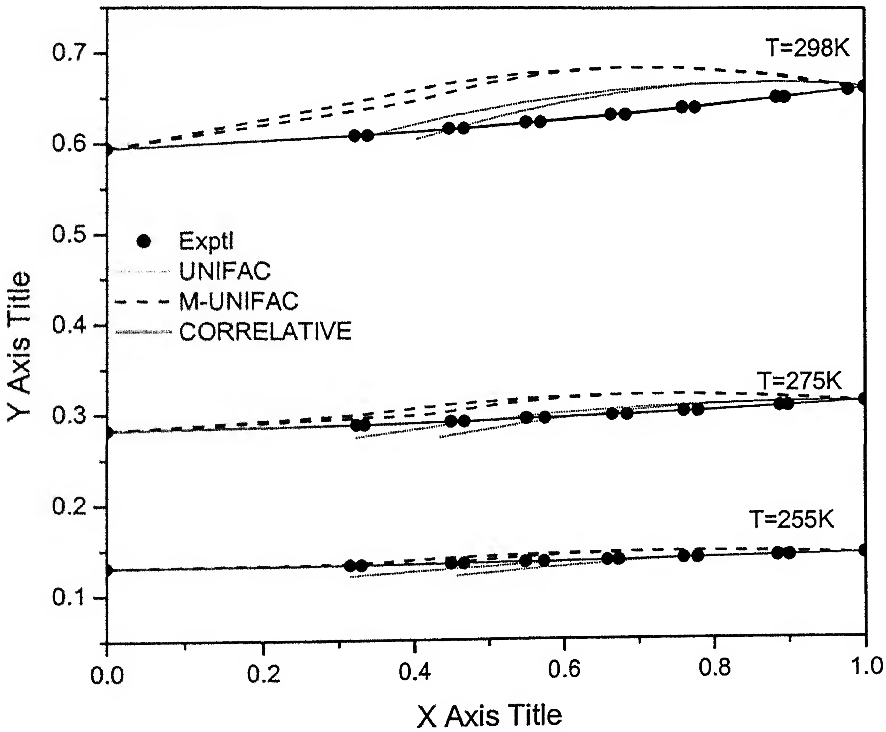

Figure 4.57 P-x-y diagram for R134a (1)/R152a (2) system using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

Table 4.61 Results of VLE Calculations for R134a (1) / R152a (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=255K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.1306	0.1306	0.1306	0.1306
0.3147	0.3298	0.3756	0.3518	0.3293	0.1328	0.1468	0.1650	0.1327
0.4489	0.4659	0.4881	0.4559	0.4699	0.1342	0.1505	0.1668	0.1342
0.5495	0.5737	0.5672	0.5301	0.5735	0.1354	0.1519	0.1664	0.1355
0.6580	0.6736	0.6531	0.6133	0.6827	0.1371	0.1523	0.1645	0.1372
0.7594	0.7777	0.7388	0.6997	0.7815	0.1389	0.1514	0.1610	0.1389
0.8843	0.8998	0.8598	0.8310	0.8981	0.1414	0.1484	0.1537	0.1414
1.0000	1.0000	1.0000	1.0000	1.0000	0.1438	0.1438	0.1438	0.1438
$\overline{\Delta y}$		0.0290	0.0471	0.0032	%AAD	9.982	19.328	0.049
T=275K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.2821	0.2821	0.2821	0.2821
0.3225	0.3329	0.3758	0.3581	0.3385	0.2883	0.3189	0.3495	0.2883
0.4483	0.4664	0.4836	0.4595	0.4698	0.2914	0.3260	0.3535	0.2916
0.5502	0.5748	0.5665	0.5382	0.5745	0.2946	0.3291	0.3535	0.2947
0.6648	0.6843	0.6604	0.6295	0.6893	0.2983	0.3299	0.3499	0.2987
0.7590	0.7782	0.7420	0.7117	0.7808	0.3023	0.3282	0.3439	0.3023
0.8874	0.8979	0.8669	0.8453	0.9005	0.3077	0.3222	0.3300	0.3077
1.0000	1.0000	1.0000	1.0000	1.0000	0.3129	0.3129	0.3129	0.3129
$\overline{\Delta y}$		0.0266	0.0404	0.0033	%AAD	9.677	16.800	0.036
T=298K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.5936	0.5936	0.5936	0.5936
0.3195	0.3365	0.3654	0.3542	0.3357	0.6084	0.6745	0.7220	0.6087
0.4460	0.4656	0.4771	0.4605	0.4673	0.6162	0.6890	0.7318	0.6162
0.5498	0.5686	0.5645	0.5446	0.5734	0.6233	0.6956	0.7331	0.6232
0.6626	0.6822	0.6600	0.6377	0.6859	0.6313	0.6975	0.7279	0.6317
0.7575	0.7744	0.7440	0.7221	0.7781	0.6394	0.6946	0.7175	0.6396
0.8828	0.8940	0.8660	0.8500	0.8953	0.6509	0.6837	0.6939	0.6509
0.9777	0.9789	0.9725	0.9683	0.9805	0.6597	0.6690	0.6667	0.6602
1.0000	1.0000	1.0000	1.0000	1.0000	0.6622	0.6622	0.6622	0.6622
$\overline{\Delta y}$		0.0188	0.0283	0.0025	%AAD	8.547	12.890	0.034

Table 4.62 Results of VLE Calculations for R134a (1) / R152a (2) System using Pure components as ref. fluids

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=255K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.1306	0.1306	0.1306	0.1306
0.3147	0.3298	0.3747	0.3510	0.3291	0.1328	0.1471	0.1653	0.1328
0.4489	0.4659	0.4872	0.4551	0.4697	0.1342	0.1507	0.1671	0.1342
0.5495	0.5737	0.5665	0.5295	0.5735	0.1354	0.1521	0.1667	0.1355
0.6580	0.6736	0.6525	0.6125	0.6827	0.1371	0.1524	0.1647	0.1372
0.7594	0.7777	0.7382	0.6991	0.7816	0.1389	0.1515	0.1611	0.1389
0.8843	0.8998	0.8595	0.8306	0.8981	0.1414	0.1485	0.1537	0.1413
1.0000	1.0000	1.0000	1.0000	1.0000	0.1438	0.1438	0.1438	0.1438
$\overline{\Delta y}$		0.0291	0.0475	0.0033	%AAD	10.115	19.487	0.047
T=275K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.2821	0.2821	0.2821	0.2821
0.3225	0.3329	0.3757	0.3580	0.3387	0.2883	0.3190	0.3496	0.2883
0.4483	0.4664	0.4835	0.4594	0.4700	0.2914	0.3260	0.3536	0.2916
0.5502	0.5748	0.5665	0.5381	0.5747	0.2946	0.3291	0.3535	0.2947
0.6648	0.6843	0.6603	0.6294	0.6894	0.2983	0.3299	0.3500	0.2987
0.7590	0.7782	0.7419	0.7116	0.7808	0.3023	0.3283	0.3439	0.3023
0.8874	0.8979	0.8669	0.8452	0.9005	0.3077	0.3222	0.3301	0.3078
1.0000	1.0000	1.0000	1.0000	1.0000	0.3129	0.3129	0.3129	0.3129
$\overline{\Delta y}$		0.0266	0.0405	0.0033	%AAD	9.694	16.827	0.038
T=298K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.5936	0.5936	0.5936	0.5936
0.3195	0.3365	0.3657	0.3545	0.3358	0.6084	0.6740	0.7215	0.6087
0.4460	0.4656	0.4773	0.4608	0.4672	0.6162	0.6886	0.7313	0.6162
0.5498	0.5686	0.5647	0.5448	0.5734	0.6233	0.6953	0.7328	0.6232
0.6626	0.6822	0.6602	0.6380	0.6859	0.6313	0.6972	0.7276	0.6317
0.7575	0.7744	0.7442	0.7223	0.7780	0.6394	0.6944	0.7173	0.6396
0.8828	0.8940	0.8661	0.8502	0.8953	0.6509	0.6836	0.6938	0.6509
0.9777	0.9789	0.9725	0.9683	0.9805	0.6597	0.6690	0.6667	0.6602
1.0000	1.0000	1.0000	1.0000	1.0000	0.6622	0.6622	0.6622	0.6622
$\overline{\Delta y}$		0.0188	0.0282	0.0025	%AAD	8.505	12.843	0.033

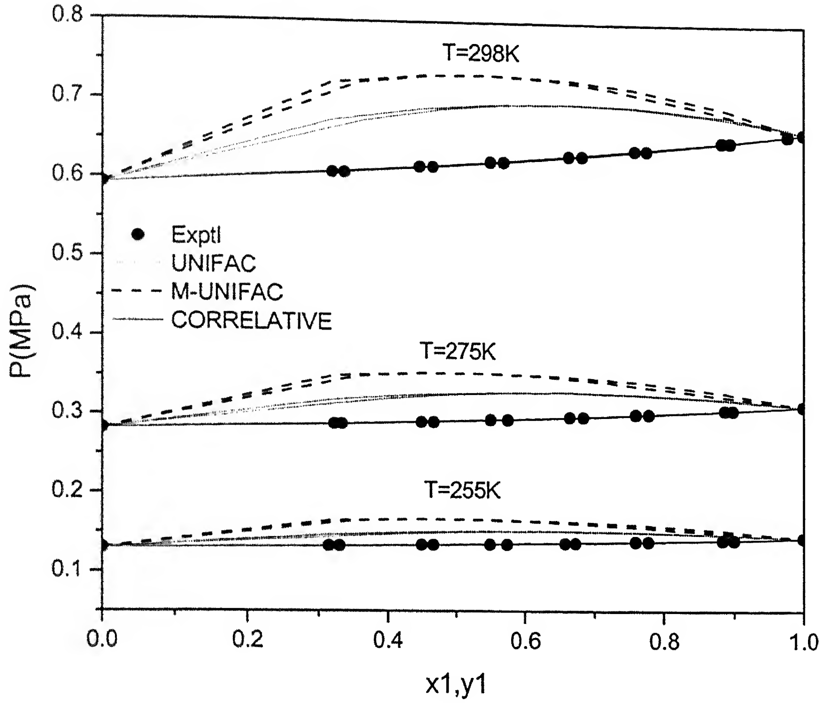

Figure 4.58 P-x-y diagram for R134a (1) / R152a (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

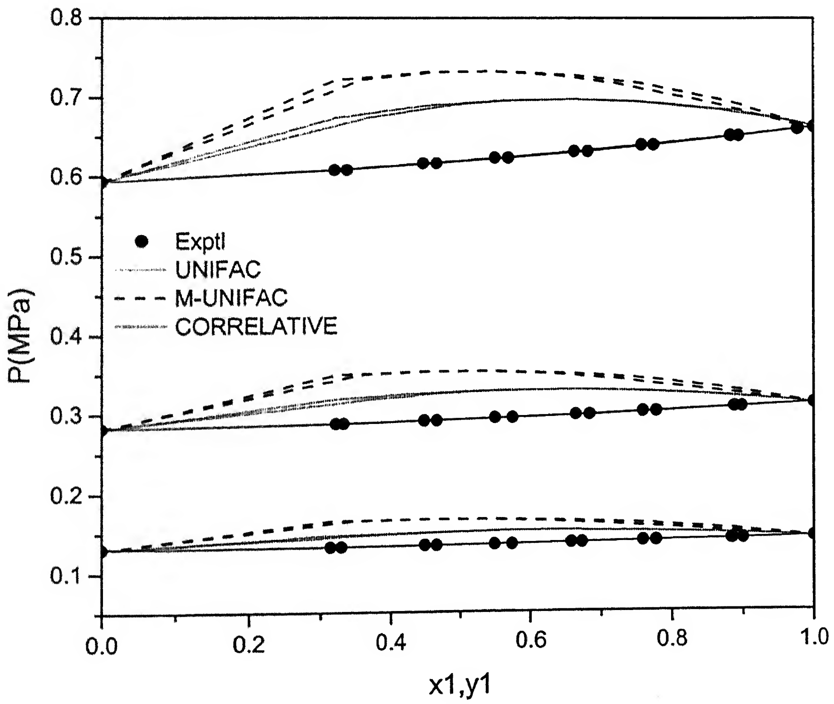

Figure 4.59 P-x-y diagram for R134a (1) / R152a (2) System using pure components as ref. fluids

Table 4.63 Results of VLE Calculations for R134a (1) / R227ea (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=298.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.456	0.456	0.456	0.456
0.123	0.190	0.1626	0.1549	0.1763	0.487	0.545	0.538	0.490
0.228	0.307	0.2843	0.2759	0.3048	0.518	0.568	0.557	0.518
0.337	0.414	0.3986	0.3929	0.4227	0.547	0.589	0.576	0.545
0.438	0.518	0.4967	0.4947	0.5220	0.570	0.607	0.592	0.567
0.533	0.604	0.5843	0.5862	0.6091	0.592	0.621	0.607	0.587
0.705	0.747	0.7365	0.7436	0.7565	0.617	0.643	0.632	0.619
0.809	0.837	0.8276	0.8353	0.8424	0.636	0.653	0.646	0.636
1.000	1.000	1.0000	1.0000	1.0000	0.664	0.664	0.664	0.664
$\overline{\Delta y}$		0.0180	0.0191	0.0069	%AAD	6.803	4.772	0.381
T=303.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.530	0.530	0.530	0.530
0.056	0.083	0.0763	0.0718	0.0828	0.547	0.607	0.603	0.546
0.279	0.356	0.3389	0.3318	0.3596	0.610	0.666	0.651	0.615
0.389	0.465	0.4498	0.4462	0.4727	0.640	0.690	0.673	0.645
0.499	0.570	0.5539	0.5544	0.5768	0.669	0.711	0.694	0.673
0.627	0.687	0.6690	0.6740	0.6897	0.697	0.732	0.717	0.702
0.723	0.769	0.7533	0.7604	0.7707	0.721	0.745	0.733	0.722
0.803	0.843	0.8228	0.8302	0.8366	0.739	0.755	0.746	0.737
0.955	0.961	0.9584	0.9614	0.9623	0.762	0.769	0.769	0.763
1.000	1.000	1.0000	1.0000	1.0000	0.770	0.770	0.770	0.770
$\overline{\Delta y}$		0.0138	0.0130	0.0039	%AAD	5.704	4.038	0.462
T=312.65K								
0.000	0.000	0.0000	0.0000	0.0000	0.693	0.693	0.693	0.693
0.106	0.143	0.1401	0.1338	0.1493	0.736	0.800	0.790	0.732
0.213	0.279	0.2658	0.2585	0.2808	0.780	0.837	0.822	0.775
0.340	0.418	0.4004	0.3956	0.4188	0.826	0.877	0.857	0.821
0.458	0.541	0.5153	0.5145	0.5346	0.867	0.909	0.888	0.861
0.539	0.619	0.5904	0.5923	0.6090	0.894	0.929	0.908	0.886
0.704	0.773	0.7375	0.7438	0.7526	0.934	0.964	0.948	0.933
0.800	0.851	0.8216	0.8285	0.8331	0.958	0.981	0.969	0.958
0.838	0.880	0.8550	0.8615	0.8648	0.969	0.987	0.978	0.967
1.000	1.000	1.0000	1.0000	1.0000	0.998	0.998	0.998	0.998
$\overline{\Delta y}$		0.0222	0.0219	0.0099	%AAD	4.810	3.012	0.464

Table 4.63 (Continued)

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=323.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.921	0.921	0.921	0.921
0.270	0.333	0.3258	0.3200	0.3393	1.026	1.114	1.090	1.036
0.393	0.453	0.4505	0.4479	0.4659	1.081	1.162	1.135	1.092
0.448	0.506	0.5042	0.5033	0.5196	1.107	1.183	1.155	1.116
0.520	0.573	0.5719	0.5733	0.5871	1.141	1.207	1.180	1.146
0.677	0.713	0.7136	0.7190	0.7264	1.203	1.255	1.233	1.205
0.798	0.823	0.8204	0.8266	0.8296	1.249	1.287	1.271	1.246
0.875	0.892	0.8882	0.8934	0.8945	1.275	1.304	1.295	1.271
0.946	0.949	0.9509	0.9538	0.9539	1.293	1.319	1.316	1.292
1.000	1.000	1.0000	1.0000	1.0000	1.320	1.320	1.320	1.320
$\overline{\Delta y}$		0.0027	0.0047	0.0093	%AAD	5.048	3.331	0.514

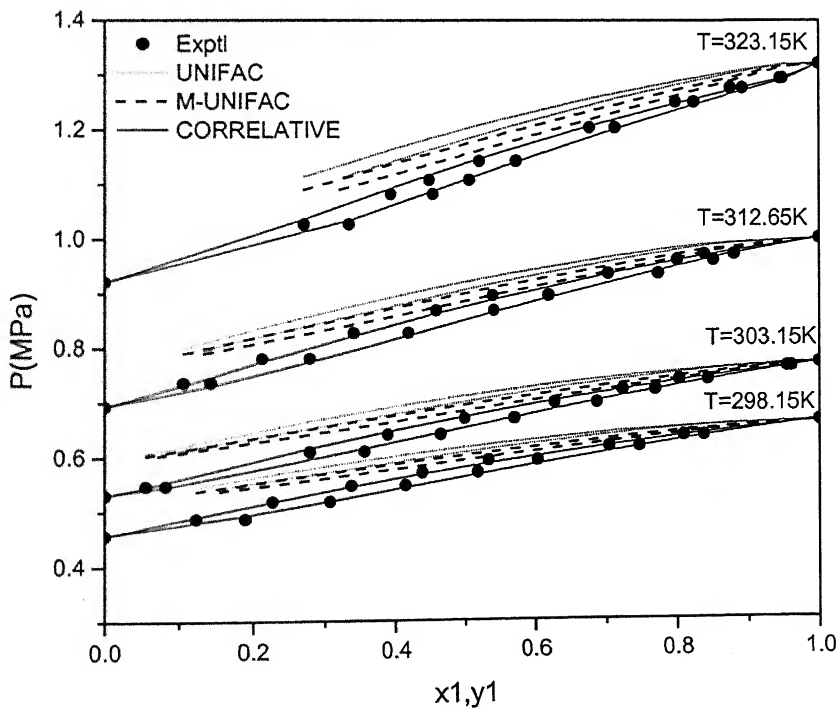

Figure 4.60 P-x-y diagram for R134a (1)/R227ea (2) system using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

Table 4.64 Results of VLE Calculations for R134a (1) / R227ea (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

x_1	y_1				P (MPa)			
Exptl	Exptl	Calculated			Exptl	Calculated		
		UNIFAC	M-UNIFAC	CORRELATIVE		UNIFAC	M-UNIFAC	CORRELATIVE
T=298.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.456	0.456	0.456	0.456
0.123	0.190	0.1832	0.1742	0.1775	0.487	0.479	0.472	0.490
0.228	0.307	0.3133	0.3041	0.3056	0.518	0.510	0.499	0.518
0.337	0.414	0.4312	0.4253	0.4230	0.547	0.538	0.525	0.545
0.438	0.518	0.5297	0.5279	0.5217	0.570	0.563	0.549	0.568
0.533	0.604	0.6157	0.6178	0.6086	0.592	0.584	0.571	0.587
0.705	0.747	0.7613	0.7680	0.7564	0.617	0.618	0.608	0.619
0.809	0.837	0.8459	0.8527	0.8426	0.636	0.637	0.630	0.636
1.000	1.000	1.0000	1.0000	1.0000	0.664	0.664	0.664	0.664
$\overline{\Delta y}$		0.0110	0.0129	0.0066	%AAD	1.112	2.907	0.379
T=303.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.530	0.530	0.530	0.530
0.056	0.083	0.0863	0.0809	0.0835	0.547	0.533	0.529	0.546
0.279	0.356	0.3669	0.3594	0.3598	0.610	0.608	0.594	0.616
0.389	0.465	0.4795	0.4758	0.4725	0.640	0.639	0.624	0.645
0.499	0.570	0.5826	0.5835	0.5763	0.669	0.668	0.653	0.673
0.627	0.687	0.6944	0.6993	0.6893	0.697	0.699	0.686	0.701
0.723	0.769	0.7745	0.7812	0.7707	0.721	0.720	0.709	0.721
0.803	0.843	0.8396	0.8463	0.8368	0.739	0.737	0.729	0.737
0.955	0.961	0.9631	0.9657	0.9625	0.762	0.766	0.765	0.763
1.000	1.000	1.0000	1.0000	1.0000	0.770	0.770	0.770	0.770
$\overline{\Delta y}$		0.0076	0.0078	0.0039	%AAD	0.512	1.955	0.474
T=312.65K								
0.000	0.000	0.0000	0.0000	0.0000	0.693	0.693	0.693	0.693
0.106	0.143	0.1533	0.1461	0.1500	0.736	0.724	0.715	0.732
0.213	0.279	0.2859	0.2780	0.2813	0.780	0.769	0.754	0.775
0.340	0.418	0.4236	0.4188	0.4187	0.826	0.818	0.800	0.822
0.458	0.541	0.5386	0.5380	0.5341	0.867	0.860	0.840	0.861
0.539	0.619	0.6126	0.6147	0.6086	0.894	0.886	0.867	0.886
0.704	0.773	0.7551	0.7611	0.7525	0.934	0.935	0.920	0.933
0.800	0.851	0.8351	0.8414	0.8334	0.958	0.961	0.951	0.957
0.838	0.880	0.8664	0.8723	0.8651	0.969	0.971	0.962	0.967
1.000	1.000	1.0000	1.0000	1.0000	0.998	0.998	0.998	0.998
$\overline{\Delta y}$		0.0099	0.0052	0.0100	%AAD	0.790	2.306	0.470

Table 4.64 (Continued)

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=323.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.921	0.921	0.921	0.921
0.270	0.333	0.3423	0.3363	0.3396	1.026	1.047	1.024	1.036
0.393	0.453	0.4682	0.4656	0.4657	1.081	1.105	1.079	1.092
0.448	0.506	0.5218	0.5211	0.5195	1.107	1.130	1.104	1.116
0.520	0.573	0.5889	0.5904	0.5868	1.141	1.160	1.135	1.145
0.677	0.713	0.7276	0.7329	0.7264	1.203	1.222	1.201	1.205
0.798	0.823	0.8306	0.8364	0.8300	1.249	1.266	1.251	1.246
0.875	0.892	0.8952	0.8999	0.8949	1.275	1.291	1.282	1.271
0.946	0.949	0.9543	0.9568	0.9542	1.293	1.314	1.310	1.293
1.000	1.000	1.0000	1.0000	1.0000	1.320	1.320	1.320	1.320
$\overline{\Delta y}$		0.0108	0.0122	0.0094	%AAD	1.717	0.416	0.492

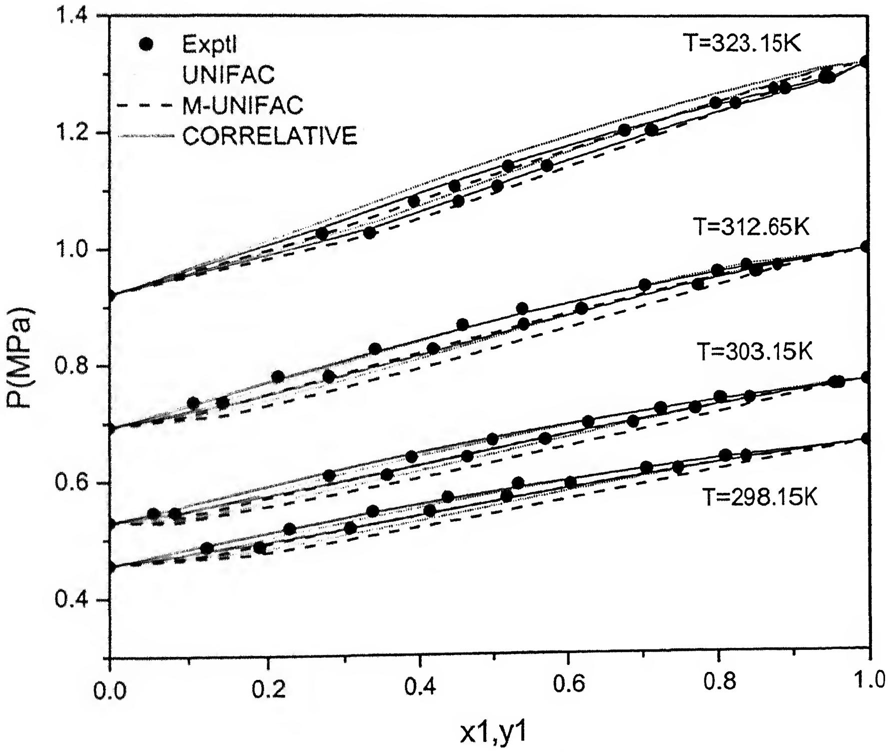

Figure 4.61 P-x-y diagram for R134a (1) / R227ea (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

Table 4.65 Results of VLE Calculations for R134a (1) / R227ea (2) System using Pure components as ref. fluids

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=298.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.456	0.456	0.456	0.456
0.123	0.190	0.1813	0.1723	0.1776	0.487	0.485	0.478	0.490
0.228	0.307	0.3105	0.3013	0.3056	0.518	0.515	0.504	0.518
0.337	0.414	0.4281	0.4221	0.4230	0.547	0.543	0.530	0.545
0.438	0.518	0.5264	0.5246	0.5218	0.570	0.567	0.553	0.568
0.533	0.604	0.6126	0.6147	0.6087	0.592	0.587	0.574	0.587
0.705	0.747	0.7589	0.7656	0.7564	0.617	0.620	0.610	0.619
0.809	0.837	0.8442	0.8511	0.8427	0.636	0.638	0.631	0.636
1.000	1.000	1.0000	1.0000	1.0000	0.664	0.664	0.664	0.664
$\overline{\Delta y}$		0.0089	0.0116	0.0066	%AAD	0.570	2.207	0.377
T=303.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.530	0.530	0.530	0.530
0.056	0.083	0.0852	0.0799	0.0835	0.547	0.541	0.537	0.546
0.279	0.356	0.3637	0.3562	0.3599	0.610	0.614	0.600	0.616
0.389	0.465	0.4762	0.4725	0.4724	0.640	0.645	0.629	0.645
0.499	0.570	0.5794	0.5801	0.5763	0.669	0.673	0.657	0.673
0.627	0.687	0.6915	0.6965	0.6893	0.697	0.703	0.689	0.701
0.723	0.769	0.7722	0.7789	0.7707	0.721	0.723	0.712	0.721
0.803	0.843	0.8378	0.8445	0.8368	0.739	0.739	0.731	0.737
0.955	0.961	0.9627	0.9652	0.9625	0.762	0.766	0.765	0.763
1.000	1.000	1.0000	1.0000	1.0000	0.770	0.770	0.770	0.770
$\overline{\Delta y}$		0.0058	0.0058	0.0039	%AAD	0.599	1.345	0.475
T=312.65K								
0.000	0.000	0.0000	0.0000	0.0000	0.693	0.693	0.693	0.693
0.106	0.143	0.1514	0.1443	0.1500	0.736	0.734	0.725	0.732
0.213	0.279	0.2830	0.2751	0.2812	0.780	0.779	0.763	0.775
0.340	0.418	0.4204	0.4155	0.4186	0.826	0.826	0.807	0.822
0.458	0.541	0.5353	0.5347	0.5341	0.867	0.866	0.846	0.861
0.539	0.619	0.6094	0.6116	0.6085	0.894	0.892	0.873	0.886
0.704	0.773	0.7527	0.7587	0.7524	0.934	0.939	0.924	0.933
0.800	0.851	0.8333	0.8396	0.8333	0.958	0.964	0.953	0.957
0.838	0.880	-	0.8709	0.8650	0.969	-	0.964	0.966
1.000	1.000	1.0000	1.0000	1.0000	0.998	0.998	0.998	0.998
$\overline{\Delta y}$		0.0097	0.0070	0.0101	%AAD	0.279	1.595	0.473

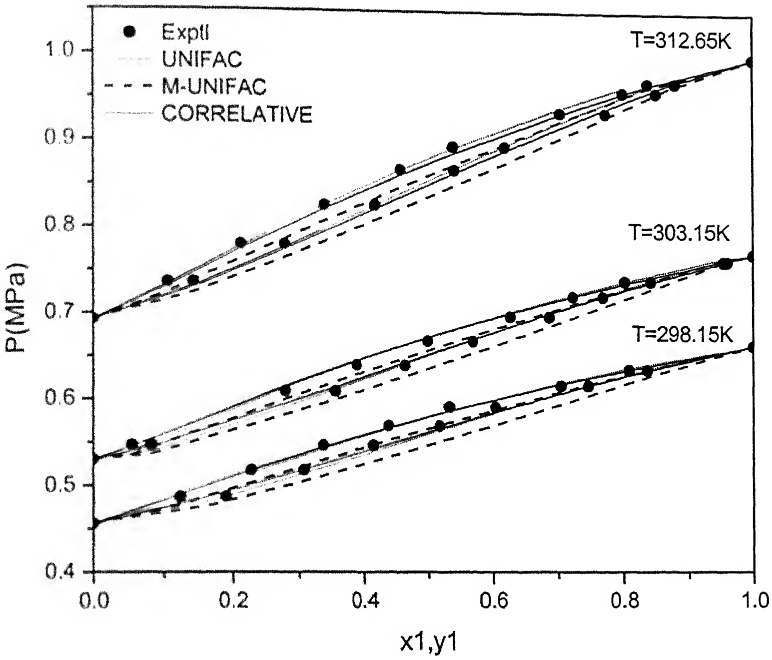

Figure 4.62 P-x-y diagram for R134a (1) / R227ea (2) System using pure components as ref. fluids

Table 4.66 Results of VLE Calculations for R134a (1) / R236fa (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=283.62K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.1626	0.1626	0.1626	0.1626
0.1154	0.2358	0.2152	0.2397	0.2362	0.1906	0.2312	0.2365	0.1907
0.2570	0.4500	0.4119	0.4370	0.4509	0.2252	0.2640	0.2756	0.2256
0.3627	0.5722	0.5286	0.5474	0.5751	0.2517	0.2871	0.3016	0.2522
0.4913	0.6940	0.6480	0.6575	0.6971	0.2844	0.3139	0.3303	0.2853
0.6056	0.7824	0.7397	0.7422	0.7856	0.3143	0.3368	0.3537	0.3152
0.7219	0.8586	0.8233	0.8209	0.8612	0.3451	0.3594	0.3760	0.3462
0.8638	0.9366	0.9165	0.9124	0.9382	0.3835	0.3864	0.4017	0.3846
1.0000	1.0000	1.0000	1.0000	1.0000	0.4207	0.4207	0.4207	0.4207
$\overline{\Delta y}$		0.0352	0.0257	0.0021	%AAD	10.719	15.523	0.234
T=303.68K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.3258	0.3258	0.3258	0.3258
0.1101	0.2057	0.1966	0.2203	0.2070	0.3725	0.4332	0.4368	0.3727
0.2743	0.4404	0.4182	0.4440	0.4434	0.4416	0.5017	0.5196	0.4427
0.4024	0.5851	0.5538	0.5726	0.5865	0.4985	0.5524	0.5772	0.4991
0.5085	0.6813	0.6502	0.6621	0.6852	0.5453	0.5928	0.6214	0.5469
0.6021	0.7590	0.7268	0.7329	0.7608	0.5882	0.6278	0.6583	0.5899
0.7151	0.8391	0.8112	0.8121	0.8405	0.6411	0.6690	0.7007	0.6429
0.7942	0.8884	0.8664	0.8651	0.8900	0.6799	0.6975	0.7293	0.6806
0.8982	0.9475	0.9354	0.9332	0.9486	0.7304	0.7346	0.7657	0.7310
1.0000	1.0000	1.0000	1.0000	1.0000	0.7809	0.7809	0.7809	0.7809
$\overline{\Delta y}$		0.0235	0.0176	0.0019	%AAD	7.960	12.242	0.183

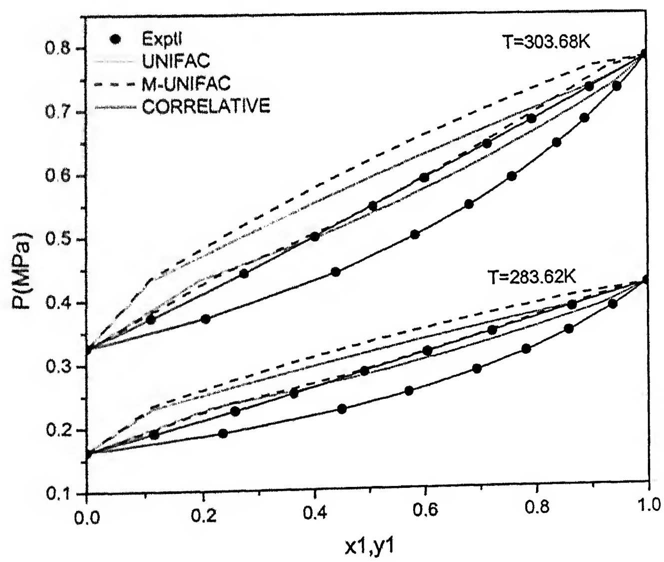

Figure 4.63 P-x-y diagram for R134a (1)/R236fa (2) system using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

Table 4.67 Results of VLE Calculations for R134a (1) / R236fa (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=283.62K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.1626	0.1626	0.1626	0.1626
0.1154	0.2358	0.2530	0.2813	0.2366	0.1906	0.1957	0.2014	0.1907
0.2570	0.4500	0.4629	0.4888	0.4514	0.2252	0.2334	0.2451	0.2257
0.3627	0.5722	0.5791	0.5974	0.5754	0.2517	0.2602	0.2745	0.2523
0.4913	0.6940	0.6927	0.7015	0.6972	0.2844	0.2917	0.3075	0.2854
0.6056	0.7824	0.7767	0.7788	0.7856	0.3143	0.3191	0.3352	0.3153
0.7219	0.8586	0.8509	0.8488	0.8611	0.3451	0.3466	0.3624	0.3462
0.8638	0.9366	0.9309	0.9276	0.9381	0.3835	0.3800	0.3948	0.3845
1.0000	1.0000	1.0000	1.0000	1.0000	0.4207	0.4207	0.4207	0.4207
$\overline{\Delta y}$		0.0082	0.0199	0.0023	%AAD	2.162	6.609	0.245
T=303.68K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.3258	0.3258	0.3258	0.3258
0.1101	0.2057	0.2215	0.2485	0.2069	0.3725	0.3812	0.3861	0.3727
0.2743	0.4404	0.4541	0.4810	0.4435	0.4416	0.4576	0.4762	0.4427
0.4024	0.5851	0.5892	0.6075	0.5865	0.4985	0.5148	0.5395	0.4991
0.5085	0.6813	0.6821	0.6931	0.6853	0.5453	0.5609	0.5888	0.5469
0.6021	0.7590	0.7541	0.7596	0.7610	0.5882	0.6011	0.6307	0.5900
0.7151	0.8391	0.8320	0.8328	0.8406	0.6411	0.6493	0.6799	0.6429
0.7942	0.8884	0.8821	0.8809	0.8901	0.6799	0.6830	0.7138	0.6807
0.8982	0.9475	0.9435	0.9418	0.9487	0.7304	0.7275	0.7581	0.7312
1.0000	1.0000	1.0000	1.0000	1.0000	0.7809	0.7809	0.7809	0.7809
$\overline{\Delta y}$		0.0071	0.0172	0.0020	%AAD	2.054	6.219	0.193

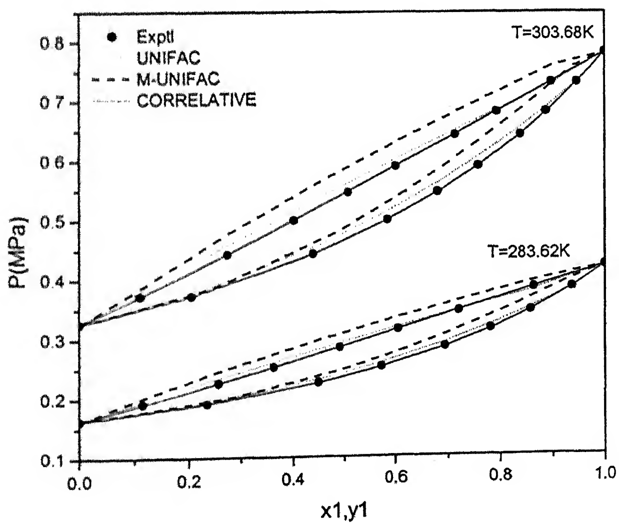

Figure 4.64 P-x-y diagram for R134a (1) / R236fa (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

Table 4.68 Results of VLE Calculations for R134a (1) / R236fa (2) System using Pure components as ref. fluids

x_1	y_1				P (MPa)			
Exptl	Exptl	Calculated			Exptl	Calculated		
		UNIFAC	M-UNIFAC	CORRELATIVE		UNIFAC	M-UNIFAC	CORRELATIVE
T=283.62K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.1626	0.1626	0.1626	0.1626
0.1154	0.2358	0.2533	0.2815	0.2366	0.1906	0.1955	0.2012	0.1907
0.2570	0.4500	0.4631	0.4891	0.4514	0.2252	0.2332	0.2450	0.2257
0.3627	0.5722	0.5796	0.5977	0.5755	0.2517	0.2601	0.2743	0.2523
0.4913	0.6940	0.6930	0.7018	0.6972	0.2844	0.2916	0.3074	0.2854
0.6056	0.7824	0.7769	0.7790	0.7856	0.3143	0.3190	0.3351	0.3153
0.7219	0.8586	0.8511	0.8490	0.8611	0.3451	0.3466	0.3623	0.3462
0.8638	0.9366	0.9310	0.9277	0.9381	0.3835	0.3800	0.3947	0.3845
1.0000	1.0000	1.0000	1.0000	1.0000	0.4207	0.4207	0.4207	0.4207
$\overline{\Delta y}$		0.0082	0.0200	0.0023	%AAD	2.122	6.560	0.246
T=303.68K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.3258	0.3258	0.3258	0.3258
0.1101	0.2057	0.2217	0.2487	0.2070	0.3725	0.3810	0.3859	0.3728
0.2743	0.4404	0.4543	0.4811	0.4435	0.4416	0.4574	0.4760	0.4427
0.4024	0.5851	0.5893	0.6077	0.5866	0.4985	0.5146	0.5394	0.4991
0.5085	0.6813	0.6823	0.6932	0.6854	0.5453	0.5608	0.5887	0.5469
0.6021	0.7590	0.7543	0.7598	0.7609	0.5882	0.6010	0.6306	0.5899
0.7151	0.8391	0.8322	0.8329	0.8406	0.6411	0.6493	0.6798	0.6429
0.7942	0.8884	0.8822	0.8809	0.8901	0.6799	0.6830	0.7137	0.6807
0.8982	0.9475	0.9436	0.9418	0.9487	0.7304	0.7275	0.7580	0.7312
1.0000	1.0000	1.0000	1.0000	1.0000	0.7809	0.7809	0.7809	0.7809
$\overline{\Delta y}$		0.0071	0.0173	0.0020	%AAD	2.029	6.192	0.194

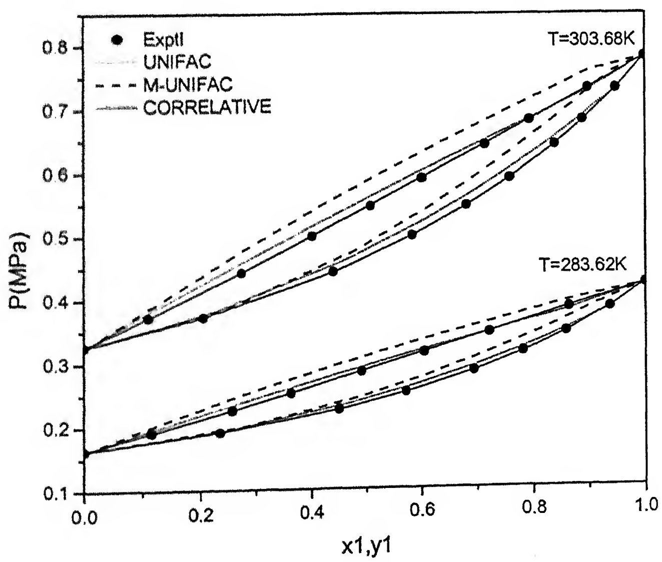

Figure 4.65 P-x-y diagram for R134a (1) / R236fa (2) System using pure components as ref. fluids

Table 4.69 Results of VLE Calculations for R134a (1) / R290 (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=255K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.2610	0.2610	0.2610	0.2610
0.1627	0.2576	0.1610	0.1970	0.2295	0.3188	0.2686	0.2834	0.3166
0.2738	0.3052	0.2400	0.2726	0.2998	0.3247	0.2665	0.2861	0.3232
0.3675	0.3297	0.2958	0.3181	0.3354	0.3250	0.2623	0.2845	0.3233
0.4290	0.3398	0.3292	0.3424	0.3520	0.3240	0.2586	0.2823	0.3219
0.6296	0.3806	0.4373	0.4126	0.3916	0.3151	0.2405	0.2689	0.3129
0.7869	0.4421	0.5533	0.4931	0.4426	0.2924	0.2156	0.2452	0.2921
0.9027	0.5698	0.7087	0.6304	0.5593	0.2412	0.1842	0.2060	0.2445
1.0000	1.0000	1.0000	1.0000	1.0000	0.1438	0.1438	0.1438	0.1438
$\overline{\Delta y}$		0.0733	0.0359	0.0105	%AAD	20.956	13.390	0.639
T=275K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.5021	0.5021	0.5021	0.5021
0.1520	0.2398	0.1607	0.1915	0.2216	0.6036	0.5243	0.5569	0.6001
0.2672	0.3122	0.2515	0.2798	0.3068	0.6221	0.5240	0.5665	0.6186
0.3479	0.3420	0.3058	0.3267	0.3468	0.6244	0.5195	0.5662	0.6214
0.4395	0.3637	0.3622	0.3710	0.3812	0.6222	0.5107	0.5607	0.6185
0.6506	0.4378	0.4925	0.4648	0.4460	0.5955	0.4751	0.5301	0.5942
0.8104	0.5311	0.6280	0.5710	0.5268	0.5374	0.4258	0.4766	0.5411
0.9122	0.6683	0.7724	0.7102	0.6560	0.4512	0.3747	0.4086	0.4577
1.0000	1.0000	1.0000	1.0000	1.0000	0.3129	0.3129	0.3129	0.3129
$\overline{\Delta y}$		0.0619	0.0303	0.0101	%AAD	17.369	9.661	0.652
T=298K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.9486	0.9486	0.9486	0.9486
0.1346	0.2136	0.1504	0.1746	0.2007	1.1153	1.0067	1.0747	1.1115
0.2313	0.2931	0.2364	0.2609	0.2875	1.1612	1.0154	1.1012	1.1556
0.3395	0.3517	0.3190	0.3362	0.3564	1.1789	1.0121	1.1091	1.1743
0.4477	0.4024	0.3939	0.3988	0.4092	1.1729	0.9972	1.0998	1.1714
0.6545	0.4944	0.5369	0.5117	0.4982	1.1178	0.9362	1.0402	1.1204
0.8067	0.6200	0.6717	0.6257	0.5934	0.9894	0.8544	0.9437	1.0215
0.9271	0.7683	0.8377	0.7942	0.7583	0.8391	0.7508	0.7998	0.8484
0.9276	0.7710	0.8386	0.7952	0.7594	0.8369	0.7503	0.7989	0.8474
0.9300	0.7793	0.8429	0.8001	0.7647	0.8347	0.7477	0.7951	0.8424
1.0000	1.0000	1.0000	1.0000	1.0000	0.6622	0.6622	0.6622	0.6622
$\overline{\Delta y}$		0.0507	0.0205	0.0108	%AAD	12.512	5.166	0.901

Table 4.70 Results of VLE Calculations for R134a (1) / R290 (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=255K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.2610	0.2610	0.2610	0.2610
0.1627	0.2576	0.1621	0.1985	0.2298	0.3188	0.2668	0.2815	0.3167
0.2738	0.3052	0.2414	0.2741	0.2999	0.3247	0.2648	0.2844	0.3232
0.3675	0.3297	0.2974	0.3196	0.3354	0.3250	0.2608	0.2830	0.3233
0.4290	0.3398	0.3308	0.3440	0.3519	0.3240	0.2572	0.2808	0.3219
0.6296	0.3806	0.4391	0.4144	0.3916	0.3151	0.2394	0.2676	0.3129
0.7869	0.4421	0.5553	0.4950	0.4428	0.2924	0.2148	0.2442	0.2921
0.9027	0.5698	0.7106	0.6325	0.5596	0.2412	0.1838	0.2053	0.2444
1.0000	1.0000	1.0000	1.0000	1.0000	0.1438	0.1438	0.1438	0.1438
$\overline{\Delta y}$		0.0733	0.0363	0.0104	%AAD	21.356	13.834	0.632
T=275K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.5021	0.5021	0.5021	0.5021
0.1520	0.2398	0.1615	0.1925	0.2219	0.6036	0.5216	0.5542	0.6001
0.2672	0.3122	0.2525	0.2811	0.3070	0.6221	0.5216	0.5641	0.6187
0.3479	0.3420	0.3069	0.3278	0.3468	0.6244	0.5173	0.5639	0.6215
0.4395	0.3637	0.3634	0.3722	0.3811	0.6222	0.5088	0.5586	0.6186
0.6506	0.4378	0.4938	0.4662	0.4460	0.5955	0.4736	0.5283	0.5942
0.8104	0.5311	0.6293	0.5724	0.5270	0.5374	0.4248	0.4753	0.5409
0.9122	0.6683	0.7734	0.7116	0.6565	0.4512	0.3742	0.4078	0.4575
1.0000	1.0000	1.0000	1.0000	1.0000	0.3129	0.3129	0.3129	0.3129
$\overline{\Delta y}$		0.0618	0.0306	0.0099	%AAD	17.658	9.984	0.635
T=298K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.9486	0.9486	0.9486	0.9486
0.1346	0.2136	0.1510	0.1752	0.2008	1.1153	1.0032	1.0711	1.1115
0.2313	0.2931	0.2370	0.2616	0.2876	1.1612	1.0122	1.0979	1.1557
0.3395	0.3517	0.3198	0.3369	0.3564	1.1789	1.0094	1.1061	1.1743
0.4477	0.4024	0.3946	0.3994	0.4091	1.1729	0.9947	1.0971	1.1714
0.6545	0.4944	0.5376	0.5125	0.4982	1.1178	0.9345	1.0380	1.1203
0.8067	0.6200	0.6725	0.6266	0.5935	0.9894	0.8532	0.9421	1.0213
0.9271	0.7683	0.8382	0.7949	0.7586	0.8391	0.7503	0.7990	0.8482
0.9276	0.7710	0.8391	0.7959	0.7596	0.8369	0.7498	0.7982	0.8472
0.9300	0.7793	0.8435	0.8009	0.7650	0.8347	0.7472	0.7943	0.8422
1.0000	1.0000	1.0000	1.0000	1.0000	0.6622	0.6622	0.6622	0.6622
$\overline{\Delta y}$		0.0507	0.0206	0.0106	%AAD	12.678	5.357	0.888

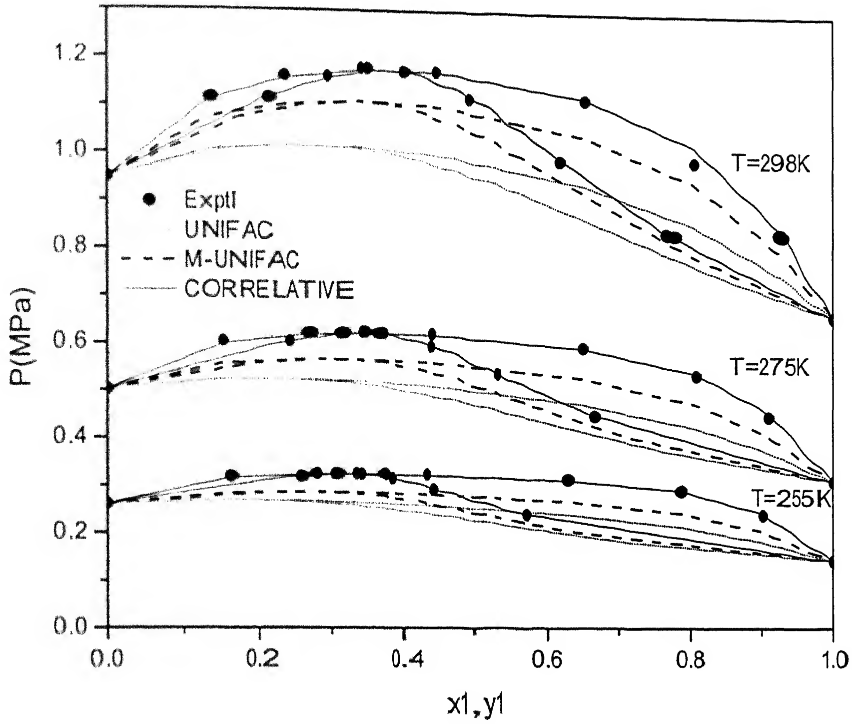

Figure 4.66 P-x-y diagram for R134a (1)/R290 (2) system using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

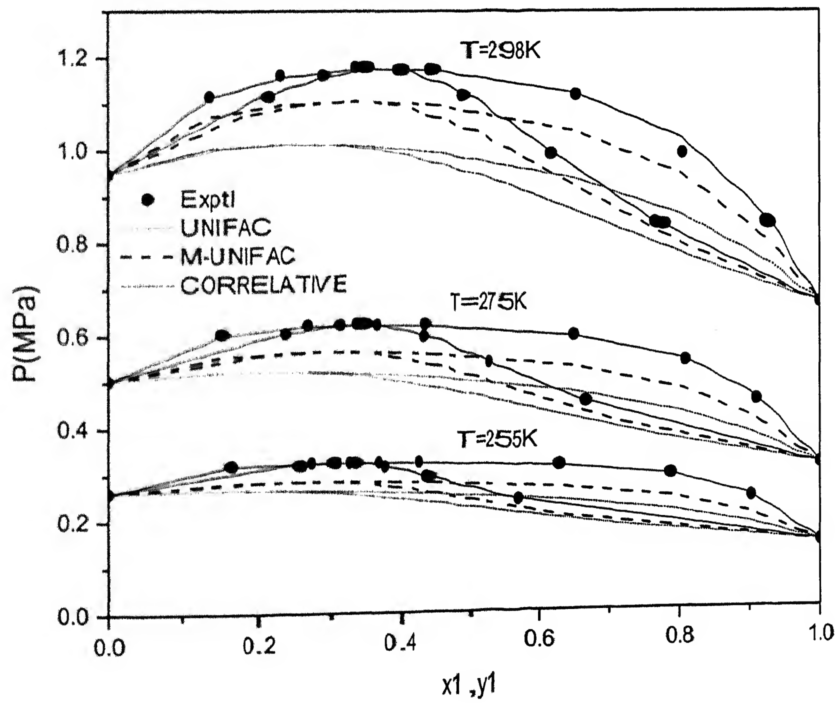

Figure 4.67 P-x-y diagram for R134a (1) / R290 (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

Table 4.71 Results of VLE Calculations for R134a (1) / R290 (2) System using Pure components as ref. fluids

x_1	y_1				P (MPa)			
Exptl	Exptl	Calculated			Exptl	Calculated		
		UNIFAC	M-UNIFAC	CORRELATIVE		UNIFAC	M-UNIFAC	CORRELATIVE
T=255K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.2610	0.2610	0.2610	0.2610
0.1627	0.2576	0.1625	0.1991	0.2305	0.3188	0.2666	0.2813	0.3166
0.2738	0.3052	0.2417	0.2746	0.3003	0.3247	0.2647	0.2842	0.3233
0.3675	0.3297	0.2974	0.3199	0.3355	0.3250	0.2607	0.2828	0.3233
0.4290	0.3398	0.3310	0.3441	0.3519	0.3240	0.2571	0.2807	0.3220
0.6296	0.3806	0.4392	0.4144	0.3914	0.3151	0.2393	0.2675	0.3130
0.7869	0.4421	0.5556	0.4954	0.4429	0.2924	0.2147	0.2440	0.2920
0.9027	0.5698	0.7109	0.6331	0.5601	0.2412	0.1837	0.2051	0.2442
1.0000	1.0000	1.0000	1.0000	1.0000	0.1438	0.1438	0.1438	0.1438
$\overline{\Delta y}$		0.0733	0.0362	0.0102	%AAD	21.399	13.885	0.619
T=275K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.5021	0.5021	0.5021	0.5021
0.1520	0.2398	0.1613	0.1923	0.2222	0.6036	0.5229	0.5555	0.6003
0.2672	0.3122	0.2521	0.2806	0.3070	0.6221	0.5228	0.5653	0.6188
0.3479	0.3420	0.3064	0.3272	0.3467	0.6244	0.5184	0.5650	0.6216
0.4395	0.3637	0.3627	0.3714	0.3809	0.6222	0.5098	0.5597	0.6186
0.6506	0.4378	0.4930	0.4654	0.4458	0.5955	0.4743	0.5292	0.5942
0.8104	0.5311	0.6288	0.5719	0.5269	0.5374	0.4251	0.4758	0.5408
0.9122	0.6683	0.7731	0.7113	0.6566	0.4512	0.3744	0.4080	0.4573
1.0000	1.0000	1.0000	1.0000	1.0000	0.3129	0.3129	0.3129	0.3129
$\overline{\Delta y}$		0.0619	0.0304	0.0098	%AAD	17.520	9.831	0.616
T=298K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.9486	0.9486	0.9486	0.9486
0.1346	0.2136	0.1504	0.1745	0.2009	1.1153	1.0080	1.0761	1.1116
0.2313	0.2931	0.2362	0.2608	0.2875	1.1612	1.0166	1.1025	1.1556
0.3395	0.3517	0.3187	0.3358	0.3563	1.1789	1.0132	1.1103	1.1742
0.4477	0.4024	0.3935	0.3983	0.4089	1.1729	0.9981	1.1008	1.1713
0.6545	0.4944	0.5365	0.5115	0.4982	1.1178	0.9368	1.0407	1.1201
0.8067	0.6200	0.6717	0.6256	0.5937	0.9894	0.8546	0.9440	1.0211
0.9271	0.7683	0.8377	0.7944	0.7589	0.8391	0.7509	0.7998	0.8480
0.9276	0.7710	0.8386	0.7953	0.7599	0.8369	0.7504	0.7990	0.8470
0.9300	0.7793	0.8430	0.8003	0.7652	0.8347	0.7478	0.7952	0.8420
1.0000	1.0000	1.0000	1.0000	1.0000	0.6622	0.6622	0.6622	0.6622
$\overline{\Delta y}$		0.0507	0.0206	0.0105	%AAD	12.457	5.109	0.878

Table 4.72 Results of VLE Calculations for R134a (1) / R600a (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRE LATIVE	Exptl	UNIFAC	M-UNIFAC	CORRE LATIVE
T=303.68K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.4107	0.4107	0.4107	0.4107
0.0825	0.3110	0.2174	0.2443	0.2972	0.5808	0.5105	0.5330	0.5723
0.1308	0.3994	0.3039	0.3332	0.3885	0.6499	0.5535	0.5846	0.6404
0.2239	0.4977	0.4250	0.4501	0.4959	0.7395	0.6222	0.6632	0.7358
0.2865	0.5427	0.4855	0.5055	0.5419	0.7813	0.6594	0.7035	0.7800
0.4822	0.6298	0.6236	0.6258	0.6315	0.8542	0.7422	0.7859	0.8569
0.6230	0.6817	0.7046	0.6956	0.6817	0.8796	0.7794	0.8185	0.8811
0.7837	0.7572	0.8032	0.7861	0.7560	0.8843	0.8034	0.8339	0.8843
0.8276	0.7861	0.8345	0.8169	0.7850	0.8779	0.8060	0.8330	0.8779
0.9133	0.8652	0.9059	0.8917	0.8638	0.8492	0.8045	0.8214	0.8491
1.0000	1.0000	1.0000	1.0000	1.0000	0.7809	0.7809	0.7809	0.7809
$\overline{\Delta y}$		0.0537	0.0358	0.0036	%AAD	11.725	7.508	0.456
T=293.66K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.3067	0.3067	0.3067	0.3067
0.0626	0.2822	0.1812	0.2076	0.2620	0.4261	0.3699	0.3839	0.4115
0.0970	0.3805	0.2536	0.2843	0.3452	0.4732	0.3951	0.4149	0.4545
0.0982	0.3751	0.2558	0.2867	0.3477	0.4701	0.3960	0.4159	0.4559
0.1082	0.3853	0.2743	0.3057	0.3671	0.4785	0.4028	0.4242	0.4671
0.1238	0.4173	0.3011	0.3330	0.3943	0.4950	0.4132	0.4366	0.4835
0.1953	0.4933	0.4011	0.4303	0.4850	0.5524	0.4550	0.4850	0.5446
0.2289	0.5182	0.4385	0.4651	0.5149	0.5691	0.4718	0.5037	0.5665
0.2969	0.5608	0.5016	0.5221	0.5605	0.6019	0.5011	0.5352	0.6006
0.4526	0.6241	0.6092	0.6144	0.6265	0.6436	0.5498	0.5833	0.6450
0.5284	0.6481	0.6524	0.6505	0.6507	0.6554	0.5666	0.5984	0.6568
0.5680	0.6607	0.6740	0.6688	0.6629	0.6618	0.5740	0.6047	0.6613
0.6513	0.6903	0.7197	0.7079	0.6903	0.6666	0.5866	0.6148	0.6676
0.7442	0.7295	0.7740	0.7568	0.7281	0.6696	0.5961	0.6207	0.6689
0.7977	0.7579	0.8091	0.7900	0.7569	0.6655	0.5990	0.6209	0.6654
0.9028	0.8427	0.8926	0.8756	0.8433	0.6414	0.5978	0.6112	0.6421
1.0000	1.0000	1.0000	1.0000	1.0000	0.5800	0.5800	0.5800	0.5800
$\overline{\Delta y}$		0.0675	0.0472	0.0097	%AAD	14.032	9.661	1.207

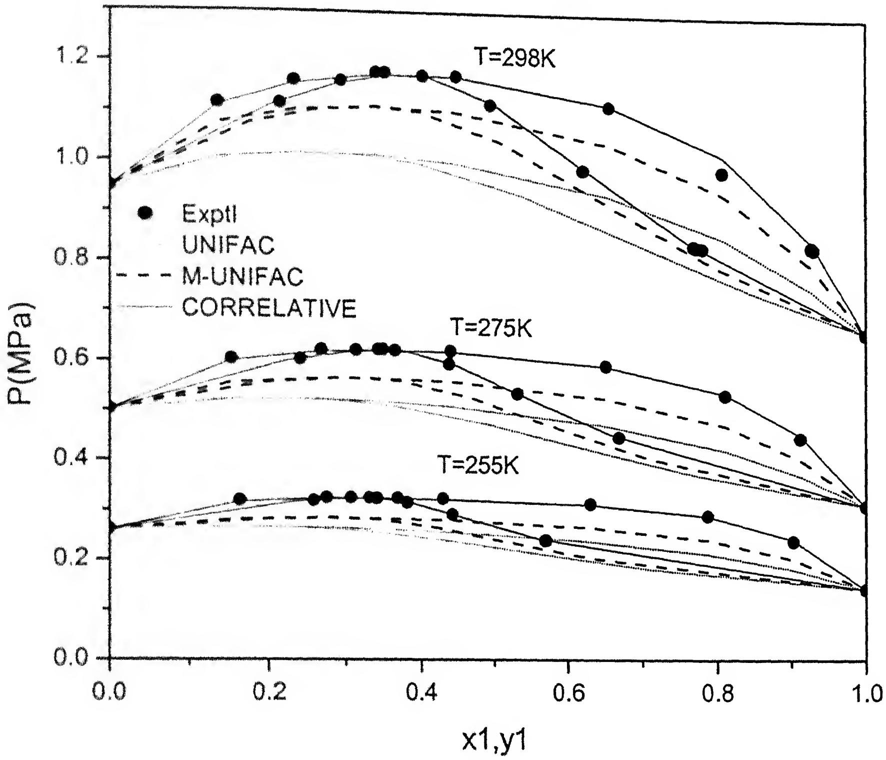

Figure 4.68 P-x-y diagram for R134a (1) / R290 (2) System using pure components as ref. fluids

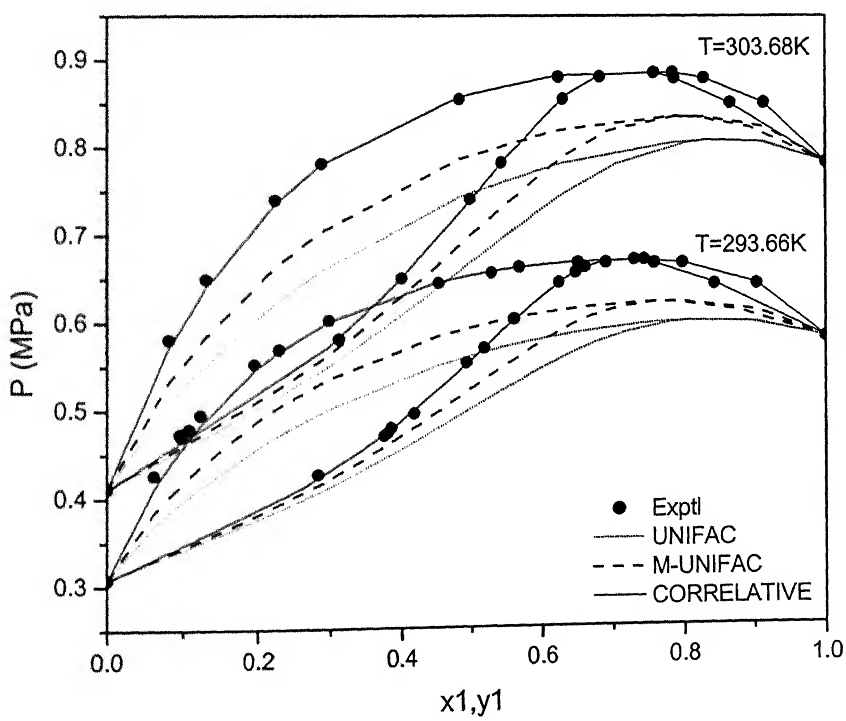

Figure 4.69 P-x-y diagram for R134a (1)/R600a (2) system using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

Table 4.73 Results of VLE Calculations for R134a (1) / R600a (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=303.68K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.4107	0.4107	0.4107	0.4107
0.0825	0.3110	0.2242	0.2519	0.2993	0.5808	0.4971	0.5197	0.5735
0.1308	0.3994	0.3118	0.3417	0.3901	0.6499	0.5407	0.5718	0.6417
0.2239	0.4977	0.4331	0.4585	0.4963	0.7395	0.6100	0.6509	0.7365
0.2865	0.5427	0.4934	0.5134	0.5418	0.7813	0.6476	0.6914	0.7802
0.4822	0.6298	0.6303	0.6324	0.6307	0.8542	0.7318	0.7749	0.8563
0.6230	0.6817	0.7107	0.7018	0.6814	0.8796	0.7707	0.8090	0.8805
0.7837	0.7572	0.8083	0.7917	0.7566	0.8843	0.7975	0.8272	0.8838
0.8276	0.7861	0.8392	0.8221	0.7860	0.8779	0.8012	0.8273	0.8775
0.9133	0.8652	0.9091	0.8954	0.8650	0.8492	0.8021	0.8185	0.8492
1.0000	1.0000	1.0000	1.0000	1.0000	0.7809	0.7809	0.7809	0.7809
$\overline{\Delta y}$		0.0518	0.0343	0.0028	%AAD	12.963	8.797	0.391
T=293.66K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.3067	0.3067	0.3067	0.3067
0.0626	0.2822	0.1882	0.2157	0.2646	0.4261	0.3581	0.3722	0.4125
0.0970	0.3805	0.2623	0.2939	0.3477	0.4732	0.3839	0.4037	0.4558
0.0982	0.3751	0.2645	0.2962	0.3501	0.4701	0.3847	0.4047	0.4572
0.1082	0.3853	0.2832	0.3154	0.3693	0.4785	0.3917	0.4131	0.4683
0.1238	0.4173	0.3104	0.3428	0.3964	0.4950	0.4022	0.4256	0.4848
0.1953	0.4933	0.4108	0.4404	0.4860	0.5524	0.4445	0.4745	0.5455
0.2289	0.5182	0.4481	0.4750	0.5154	0.5691	0.4615	0.4933	0.5672
0.2969	0.5608	0.5108	0.5312	0.5602	0.6019	0.4912	0.5250	0.6008
0.4526	0.6241	0.6172	0.6224	0.6257	0.6436	0.5408	0.5739	0.6447
0.5284	0.6481	0.6601	0.6581	0.6500	0.6554	0.5583	0.5895	0.6564
0.5680	0.6607	0.6816	0.6762	0.6622	0.6618	0.5661	0.5961	0.6609
0.6513	0.6903	0.7268	0.7152	0.6899	0.6666	0.5796	0.6071	0.6672
0.7442	0.7295	0.7806	0.7637	0.7285	0.6696	0.5904	0.6142	0.6685
0.7977	0.7579	0.8151	0.7965	0.7578	0.6655	0.5943	0.6154	0.6651
0.9028	0.8427	0.8967	0.8805	0.8447	0.6414	0.5954	0.6082	0.6420
1.0000	1.0000	1.0000	1.0000	1.0000	0.5800	0.5800	0.5800	0.5800
$\overline{\Delta y}$		0.0649	0.0443	0.0088	%AAD	15.650	11.323	1.097

Table 4.74 Results of VLE Calculations for R134a (1) / R600a (2) System using Pure components as ref. fluids

x_1	y_1				P (MPa)			
Exptl	Exptl	Calculated			Exptl	Calculated		
		UNIFAC	M-UNIFAC	CORRELATIVE		UNIFAC	M-UNIFAC	CORRELATIVE
T=303.68K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.4107	0.4107	0.4107	0.4107
0.0825	0.3110	0.2242	0.2519	0.2993	0.5808	0.4970	0.5196	0.5735
0.1308	0.3994	0.3118	0.3416	0.3901	0.6499	0.5406	0.5717	0.6417
0.2239	0.4977	0.4331	0.4585	0.4964	0.7395	0.6099	0.6509	0.7366
0.2865	0.5427	0.4935	0.5135	0.5418	0.7813	0.6476	0.6914	0.7802
0.4822	0.6298	0.6304	0.6324	0.6307	0.8542	0.7319	0.7749	0.8564
0.6230	0.6817	0.7107	0.7017	0.6815	0.8796	0.7707	0.8090	0.8806
0.7837	0.7572	0.8083	0.7916	0.7566	0.8843	0.7975	0.8272	0.8838
0.8276	0.7861	0.8391	0.8221	0.7859	0.8779	0.8011	0.8273	0.8775
0.9133	0.8652	0.9091	0.8954	0.8650	0.8492	0.8021	0.8185	0.8492
1.0000	1.0000	1.0000	1.0000	1.0000	0.7809	0.7809	0.7809	0.7809
$\overline{\Delta y}$		0.0518	0.0343	0.0028	%AAD	12.966	8.802	0.392
T=293.66K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.3067	0.3067	0.3067	0.3067
0.0626	0.2822	0.1880	0.2155	0.2643	0.4261	0.3582	0.3723	0.4123
0.0970	0.3805	0.2620	0.2937	0.3474	0.4732	0.3839	0.4037	0.4557
0.0982	0.3751	0.2642	0.2960	0.3497	0.4701	0.3847	0.4047	0.4570
0.1082	0.3853	0.2830	0.3153	0.3692	0.4785	0.3917	0.4131	0.4683
0.1238	0.4173	0.3102	0.3427	0.3961	0.4950	0.4022	0.4256	0.4847
0.1953	0.4933	0.4107	0.4402	0.4858	0.5524	0.4445	0.4745	0.5454
0.2289	0.5182	0.4479	0.4748	0.5152	0.5691	0.4615	0.4933	0.5670
0.2969	0.5608	0.5107	0.5311	0.5603	0.6019	0.4912	0.5250	0.6007
0.4526	0.6241	0.6173	0.6223	0.6257	0.6436	0.5409	0.5738	0.6447
0.5284	0.6481	0.6601	0.6582	0.6499	0.6554	0.5584	0.5896	0.6564
0.5680	0.6607	0.6816	0.6763	0.6623	0.6618	0.5661	0.5962	0.6609
0.6513	0.6903	0.7267	0.7151	0.6900	0.6666	0.5796	0.6071	0.6673
0.7442	0.7295	0.7806	0.7635	0.7284	0.6696	0.5904	0.6142	0.6685
0.7977	0.7579	0.8151	0.7966	0.7577	0.6655	0.5943	0.6154	0.6651
0.9028	0.8427	0.8967	0.8804	0.8447	0.6414	0.5954	0.6083	0.6420
1.0000	1.0000	1.0000	1.0000	1.0000	0.5800	0.5800	0.5800	0.5800
$\overline{\Delta y}$		0.0650	0.0444	0.0089	%AAD	15.647	11.321	1.110

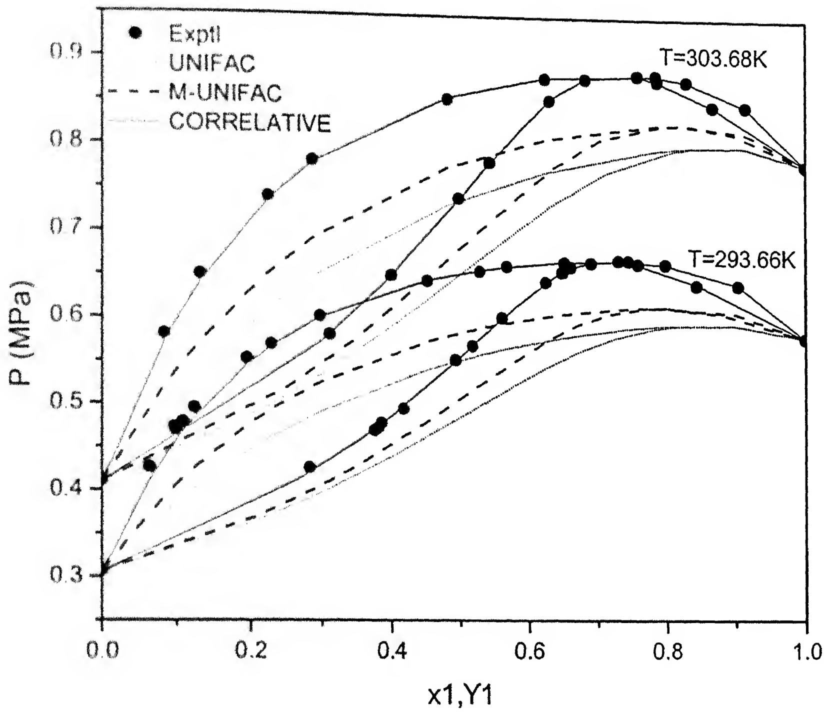

Figure 4.70 P-x-y diagram for R134a (1) / R600a (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

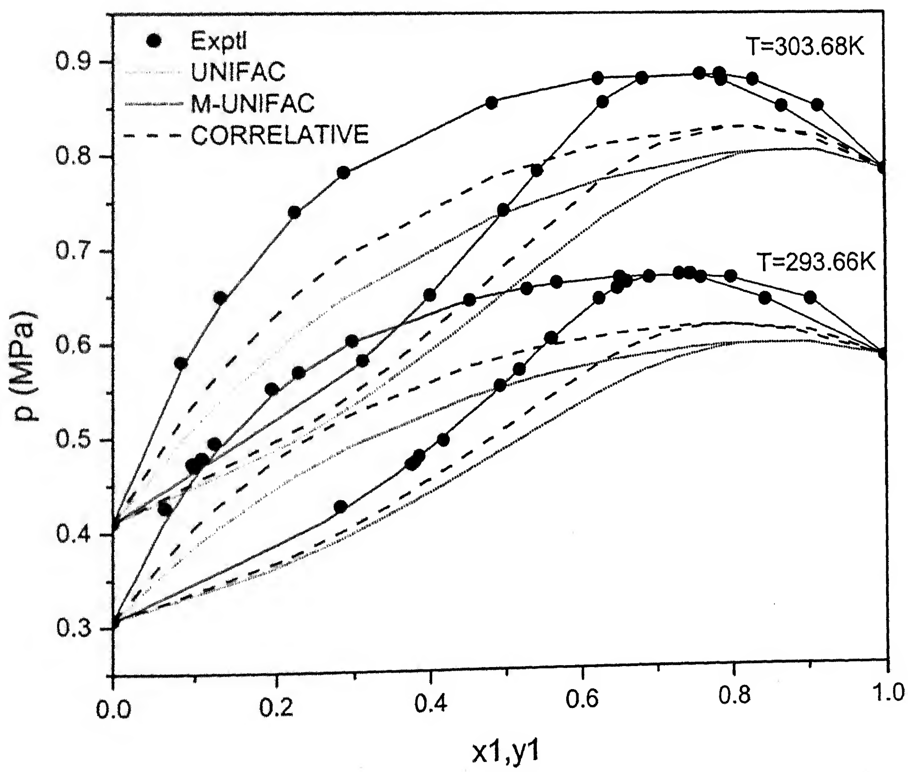

Figure 4.71 P-x-y diagram for R134a (1) / R600a (2) System using pure components as ref. fluids

Table 4.75 Results of VLE Calculations for R143a (1) / R134a (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

x1	y1				P (Mpa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=263.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.2001	0.2001	0.2001	0.2001
0.0834	0.1522	0.1446	0.1575	0.1631	0.2219	0.2138	0.2173	0.2227
0.1999	0.3449	0.3160	0.3314	0.3468	0.2498	0.2351	0.2421	0.2516
0.3629	0.5396	0.5112	0.5185	0.5446	0.2874	0.2649	0.2739	0.2919
0.5208	0.6878	0.6648	0.6622	0.6927	0.3270	0.2939	0.3024	0.3309
0.6520	0.7796	0.7726	0.7648	0.7937	0.3600	0.3180	0.3247	0.3635
0.7957	0.8811	0.8752	0.8663	0.8877	0.3959	0.3447	0.3481	0.3995
0.9214	0.9592	0.9545	0.9495	0.9593	0.4293	0.3682	0.3680	0.4313
1.0000	1.0000	1.0000	1.0000	1.0000	0.4501	0.4501	0.4501	0.4501
$\overline{\Delta y}$		0.0151	0.0150	0.0062	%AAD	9.479	7.647	0.880
T=273.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.2924	0.2924	0.2924	0.2924
0.0844	0.1462	0.1413	0.1521	0.1563	0.3182	0.3110	0.3163	0.3211
0.1781	0.2745	0.2781	0.2911	0.3020	0.3505	0.3345	0.3434	0.3517
0.3219	0.4566	0.4562	0.4633	0.4837	0.3971	0.3707	0.3823	0.3987
0.4779	0.6171	0.6161	0.6143	0.6409	0.4461	0.4101	0.4214	0.4498
0.6642	0.7720	0.7746	0.7656	0.7915	0.5068	0.4576	0.4649	0.5113
0.7946	0.8721	0.8697	0.8604	0.8802	0.5542	0.4911	0.4940	0.5549
0.9007	0.9385	0.9396	0.9335	0.9446	0.5892	0.5186	0.5170	0.5908
1.0000	1.0000	1.0000	1.0000	1.0000	0.6218	0.6218	0.6218	0.6218
$\overline{\Delta y}$		0.0023	0.0079	0.0174	%AAD	7.802	6.184	0.535
T=283.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.4144	0.4144	0.4144	0.4144
0.0830	0.1459	0.1345	0.1433	0.1462	0.4457	0.4385	0.4468	0.4483
0.1644	0.2654	0.2517	0.2624	0.2699	0.4821	0.4658	0.4781	0.4825
0.3602	0.5018	0.4880	0.4910	0.5101	0.5603	0.5318	0.5478	0.5650
0.5171	0.6516	0.6425	0.6375	0.6616	0.6276	0.5852	0.5993	0.6316
0.6606	0.7694	0.7641	0.7547	0.7782	0.6886	0.6344	0.6439	0.6931
0.8116	0.8768	0.8766	0.8675	0.8844	0.7558	0.6869	0.6888	0.7587
0.8904	0.9385	0.9303	0.9236	0.9347	0.7924	0.7147	0.7116	0.7936
1.0000	1.0000	1.0000	1.0000	1.0000	0.8399	0.8399	0.8399	0.8399
$\overline{\Delta y}$		0.0088	0.0099	0.0062	%AAD	6.235	4.768	0.478

Table 4.75 (Continued)

x1	y1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=293.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.5718	0.5718	0.5718	0.5718
0.0857	0.1311	0.1341	0.1413	0.1433	0.6091	0.6043	0.6183	0.6123
0.1982	0.3036	0.2886	0.2964	0.3042	0.6642	0.6536	0.6736	0.6718
0.3384	0.4663	0.4543	0.4566	0.4718	0.7424	0.7155	0.7383	0.7462
0.5041	0.6377	0.6209	0.6153	0.6362	0.8339	0.7894	0.8098	0.8350
0.6444	0.7575	0.7431	0.7334	0.7547	0.9138	0.8529	0.8671	0.9112
0.8067	0.8804	0.8682	0.8589	0.8745	1.0074	0.9275	0.9306	1.0010
0.8896	0.9319	0.9267	0.9201	0.9303	1.0461	0.9662	0.9621	1.0477
1.0000	1.0000	1.0000	1.0000	1.0000	1.1107	1.1107	1.1107	1.1107
$\overline{\Delta y}$		0.0112	0.0153	0.0043	%AAD	4.796	3.878	0.485
T=303.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.7690	0.7690	0.7690	0.7690
0.0801	0.1211	0.1215	0.1271	0.1281	0.8118	0.8092	0.8320	0.8118
0.1911	0.2908	0.2715	0.2774	0.2831	0.8829	0.8715	0.9016	0.8841
0.3194	0.4504	0.4233	0.4247	0.4366	0.9739	0.9441	0.9776	0.9681
0.5018	0.6195	0.6087	0.6023	0.6204	1.0869	1.0488	1.0789	1.0892
0.6387	0.7414	0.7299	0.7199	0.7387	1.1788	1.1289	1.1509	1.1817
0.8100	0.8718	0.8654	0.8562	0.8700	1.3044	1.2311	1.2374	1.3001
0.8932	0.9292	0.9261	0.9197	0.9286	1.3566	1.2819	1.2781	1.3590
1.0000	1.0000	1.0000	1.0000	1.0000	1.4340	1.4340	1.4340	1.4340
$\overline{\Delta y}$		0.0113	0.0156	0.0049	%AAD	3.362	2.715	0.242
T=313.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	1.0145	1.0145	1.0145	1.0145
0.1149	0.1677	0.1651	0.1698	0.1713	1.0946	1.0908	1.1316	1.0871
0.1823	0.2703	0.2525	0.2567	0.2607	1.1459	1.1384	1.1840	1.1402
0.3242	0.4289	0.4183	0.4180	0.4281	1.2509	1.2397	1.2897	1.2532
0.4932	0.5951	0.5900	0.5830	0.5986	1.3884	1.3625	1.4082	1.3898
0.6320	0.7208	0.7149	0.7050	0.7215	1.5049	1.4655	1.5011	1.5045
0.8028	0.8569	0.8540	0.8449	0.8575	1.6555	1.5958	1.6109	1.6494
0.8922	0.9244	0.9218	0.9157	0.9236	1.7289	1.6658	1.6667	1.7275
1.0000	1.0000	1.0000	1.0000	1.0000	1.8318	1.8318	1.8318	1.8318
$\overline{\Delta y}$		0.0068	0.0108	0.0028	%AAD	1.947	2.541	0.278

Table 4.76 Results of VLE Calculations for R143a (1) / R134a (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

x_1	y_1				P (Mpa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=263.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.2001	0.2001	0.2001	0.2001
0.0834	0.1522	0.1623	0.1771	0.1636	0.2219	0.2185	0.2227	0.2226
0.1999	0.3449	0.3460	0.3624	0.3473	0.2498	0.2467	0.2547	0.2516
0.3629	0.5396	0.5447	0.5515	0.5449	0.2874	0.2863	0.2963	0.2920
0.5208	0.6878	0.6935	0.6908	0.6928	0.3270	0.3249	0.3341	0.3310
0.6520	0.7796	0.7947	0.7873	0.7936	0.3600	0.3572	0.3642	0.3636
0.7957	0.8811	0.8885	0.8806	0.8875	0.3959	0.3930	0.3964	0.3995
0.9214	0.9592	0.9597	0.9554	0.9591	0.4293	0.4247	0.4244	0.4313
1.0000	1.0000	1.0000	1.0000	1.0000	0.4501	0.4501	0.4501	0.4501
$\overline{\Delta y}$		0.0064	0.0099	0.0063	%AAD	0.916	1.433	0.885
T=273.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.2924	0.2924	0.2924	0.2924
0.0844	0.1462	0.1550	0.1672	0.1564	0.3182	0.3165	0.3224	0.3211
0.1781	0.2745	0.3003	0.3144	0.3020	0.3505	0.3463	0.3562	0.3517
0.3219	0.4566	0.4827	0.4900	0.4836	0.3971	0.3923	0.4050	0.3987
0.4779	0.6171	0.6408	0.6388	0.6407	0.4461	0.4427	0.4547	0.4498
0.6642	0.7720	0.7921	0.7837	0.7912	0.5068	0.5037	0.5112	0.5112
0.7946	0.8721	0.8808	0.8724	0.8799	0.5542	0.5470	0.5497	0.5547
0.9007	0.9385	0.9450	0.9397	0.9445	0.5892	0.5828	0.5808	0.5905
1.0000	1.0000	1.0000	1.0000	1.0000	0.6218	0.6218	0.6218	0.6218
$\overline{\Delta y}$		0.0171	0.0185	0.0173	%AAD	0.961	1.423	0.524
T=283.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.4144	0.4144	0.4144	0.4144
0.0830	0.1459	0.1446	0.1544	0.1461	0.4457	0.4444	0.4533	0.4484
0.1644	0.2654	0.2679	0.2792	0.2698	0.4821	0.4776	0.4909	0.4826
0.3602	0.5018	0.5088	0.5116	0.5098	0.5603	0.5584	0.5754	0.5650
0.5171	0.6516	0.6611	0.6560	0.6612	0.6276	0.6241	0.6389	0.6315
0.6606	0.7694	0.7783	0.7693	0.7778	0.6886	0.6851	0.6947	0.6929
0.8116	0.8768	0.8848	0.8765	0.8842	0.7558	0.7506	0.7521	0.7584
0.8904	0.9385	0.9351	0.9292	0.9346	0.7924	0.7853	0.7818	0.7932
1.0000	1.0000	1.0000	1.0000	1.0000	0.8399	0.8399	0.8399	0.8399
$\overline{\Delta y}$		0.0058	0.0066	0.0060	%AAD	0.605	1.529	0.462

Table 4.76 (Continued)

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=293.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.5718	0.5718	0.5718	0.5718
0.0857	0.1311	0.1415	0.1494	0.1431	0.6091	0.6106	0.6252	0.6125
0.1982	0.3036	0.3016	0.3098	0.3037	0.6642	0.6684	0.6895	0.6718
0.3384	0.4663	0.4697	0.4720	0.4714	0.7424	0.7414	0.7653	0.7461
0.5041	0.6377	0.6352	0.6296	0.6358	0.8339	0.8291	0.8501	0.8347
0.6444	0.7575	0.7544	0.7451	0.7544	0.9138	0.9049	0.9193	0.9109
0.8067	0.8804	0.8748	0.8661	0.8743	1.0074	0.9946	0.9974	1.0007
0.8896	0.9319	0.9305	0.9245	0.9302	1.0461	1.0415	1.0369	1.0474
1.0000	1.0000	1.0000	1.0000	1.0000	1.1107	1.1107	1.1107	1.1107
$\overline{\Delta y}$		0.0041	0.0104	0.0043	%AAD	0.612	1.990	0.487
T=303.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.7690	0.7690	0.7690	0.7690
0.0801	0.1211	0.1263	0.1323	0.1280	0.8118	0.8150	0.8383	0.8118
0.1911	0.2908	0.2804	0.2865	0.2828	0.8829	0.8854	0.9165	0.8839
0.3194	0.4504	0.4341	0.4354	0.4363	0.9739	0.9679	1.0024	0.9679
0.5018	0.6195	0.6189	0.6124	0.6202	1.0869	1.0878	1.1185	1.0889
0.6387	0.7414	0.7382	0.7285	0.7386	1.1788	1.1801	1.2024	1.1814
0.8100	0.8718	0.8701	0.8614	0.8699	1.3044	1.2990	1.3050	1.3001
0.8932	0.9292	0.9287	0.9229	0.9285	1.3566	1.3584	1.3543	1.3591
1.0000	1.0000	1.0000	1.0000	1.0000	1.4340	1.4340	1.4340	1.4340
$\overline{\Delta y}$		0.0054	0.0096	0.0050	%AAD	0.290	2.162	0.238
T=313.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	1.0145	1.0145	1.0145	1.0145
0.1149	0.1677	0.1690	0.1740	0.1712	1.0946	1.0983	1.1399	1.0868
0.1823	0.2703	0.2580	0.2622	0.2606	1.1459	1.1503	1.1969	1.1399
0.3242	0.4289	0.4253	0.4248	0.4279	1.2509	1.2615	1.3126	1.2527
0.4932	0.5951	0.5968	0.5898	0.5985	1.3884	1.3974	1.4438	1.3895
0.6320	0.7208	0.7206	0.7107	0.7215	1.5049	1.5123	1.5481	1.5043
0.8028	0.8569	0.8573	0.8486	0.8575	1.6555	1.6587	1.6737	1.6499
0.8922	0.9244	0.9236	0.9179	0.9236	1.7289	1.7379	1.7387	1.7285
1.0000	1.0000	1.0000	1.0000	1.0000	1.8318	1.8318	1.8318	1.8318
$\overline{\Delta y}$		0.0029	0.0070	0.0028	%AAD	0.489	3.148	0.266

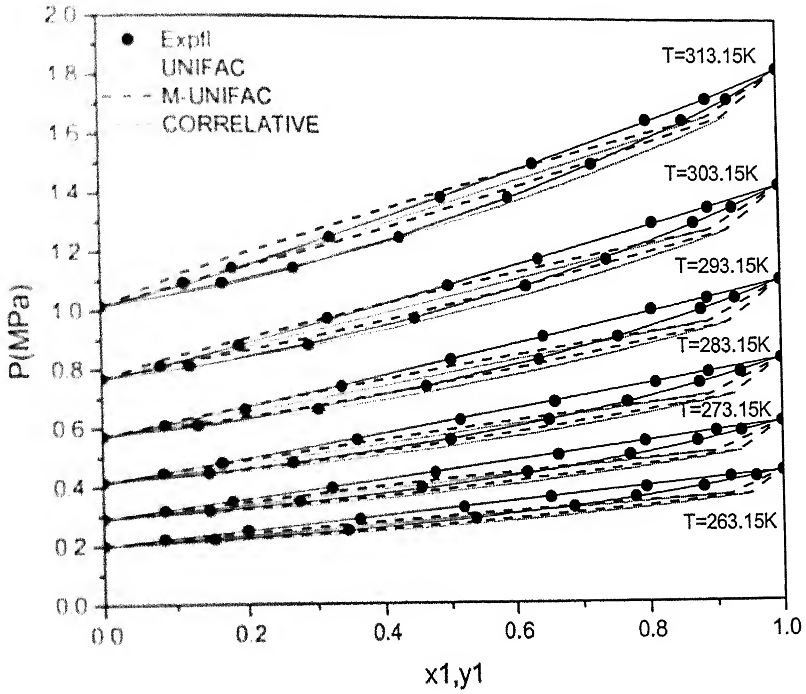

Figure 4.72 P-x-y diagram for R143a (1)/R134a (2) system using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

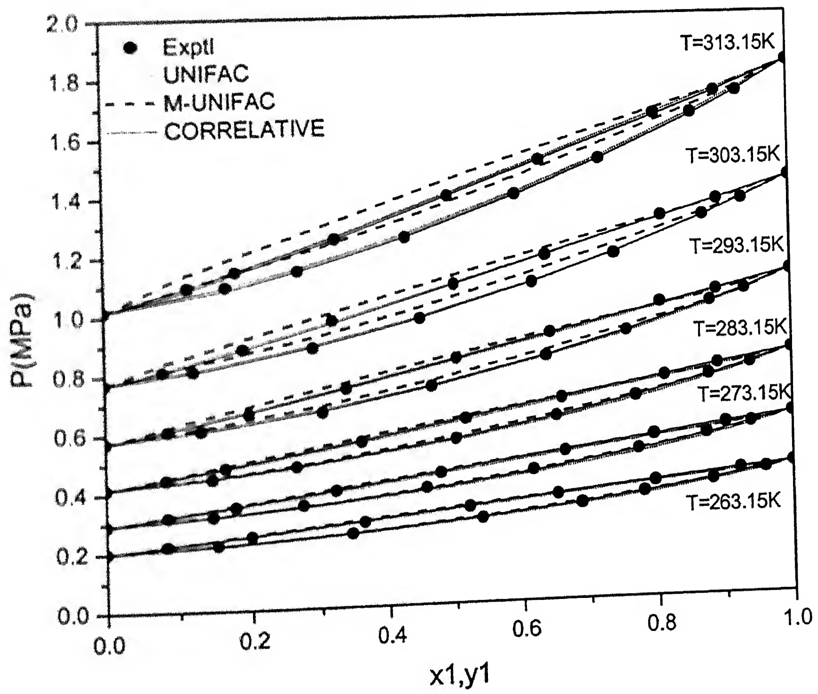

Figure 4.73 P-x-y diagram for R143a (1) / R134a (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

Table 4.77 Results of VLE Calculations for R143a (1) / R134a (2) System using Pure components as ref. fluids

x_1	y_1				P (Mpa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=263.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.2001	0.2001	0.2001	0.2001
0.0834	0.1522	0.1623	0.1771	0.1639	0.2219	0.2184	0.2226	0.2225
0.1999	0.3449	0.3458	0.3623	0.3477	0.2498	0.2465	0.2546	0.2516
0.3629	0.5396	0.5442	0.5511	0.5452	0.2874	0.2859	0.2960	0.2920
0.5208	0.6878	0.6930	0.6902	0.6929	0.3270	0.3243	0.3335	0.3311
0.6520	0.7796	0.7942	0.7868	0.7935	0.3600	0.3564	0.3634	0.3637
0.7957	0.8811	0.8882	0.8803	0.8874	0.3959	0.3919	0.3954	0.3996
0.9214	0.9592	0.9595	0.9552	0.9591	0.4293	0.4234	0.4231	0.4313
1.0000	1.0000	1.0000	1.0000	1.0000	0.4501	0.4501	0.4501	0.4501
$\overline{\Delta y}$		0.0061	0.0097	0.0065	%AAD	1.090	1.384	0.896
T=273.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.2924	0.2924	0.2924	0.2924
0.0844	0.1462	0.1548	0.1670	0.1566	0.3182	0.3163	0.3222	0.3211
0.1781	0.2745	0.2999	0.3137	0.3021	0.3505	0.3460	0.3558	0.3518
0.3219	0.4566	0.4820	0.4894	0.4837	0.3971	0.3917	0.4044	0.3988
0.4779	0.6171	0.6400	0.6381	0.6406	0.4461	0.4417	0.4537	0.4498
0.6642	0.7720	0.7915	0.7831	0.7911	0.5068	0.5022	0.5097	0.5112
0.7946	0.8721	0.8804	0.8720	0.8798	0.5542	0.5451	0.5479	0.5546
0.9007	0.9385	0.9448	0.9395	0.9444	0.5892	0.5806	0.5786	0.5904
1.0000	1.0000	1.0000	1.0000	1.0000	0.6218	0.6218	0.6218	0.6218
$\overline{\Delta y}$		0.0166	0.0180	0.0173	%AAD	1.181	1.400	0.522
T=283.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.4144	0.4144	0.4144	0.4144
0.0830	0.1459	0.1443	0.1540	0.1461	0.4457	0.4441	0.4530	0.4485
0.1644	0.2654	0.2673	0.2786	0.2698	0.4821	0.4771	0.4903	0.4827
0.3602	0.5018	0.5079	0.5107	0.5097	0.5603	0.5572	0.5742	0.5650
0.5171	0.6516	0.6603	0.6552	0.6611	0.6276	0.6224	0.6371	0.6314
0.6606	0.7694	0.7777	0.7687	0.7778	0.6886	0.6829	0.6925	0.6928
0.8116	0.8768	0.8845	0.8761	0.8842	0.7558	0.7478	0.7494	0.7583
0.8904	0.9385	0.9349	0.9290	0.9346	0.7924	0.7822	0.7787	0.7930
1.0000	1.0000	1.0000	1.0000	1.0000	0.8399	0.8399	0.8399	0.8399
$\overline{\Delta y}$		0.0054	0.0064	0.0060	%AAD	0.850	1.498	0.458

Table 4.77 (Continued)

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=293.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.5718	0.5718	0.5718	0.5718
0.0857	0.1311	0.1411	0.1491	0.1431	0.6091	0.6103	0.6249	0.6126
0.1982	0.3036	0.3009	0.3090	0.3036	0.6642	0.6676	0.6886	0.6719
0.3384	0.4663	0.4688	0.4711	0.4713	0.7424	0.7399	0.7638	0.7461
0.5041	0.6377	0.6344	0.6289	0.6357	0.8339	0.8269	0.8479	0.8347
0.6444	0.7575	0.7538	0.7446	0.7543	0.9138	0.9020	0.9164	0.9108
0.8067	0.8804	0.8745	0.8658	0.8743	1.0074	0.9910	0.9938	1.0005
0.8896	0.9319	0.9304	0.9243	0.9302	1.0461	1.0374	1.0329	1.0473
1.0000	1.0000	1.0000	1.0000	1.0000	1.1107	1.1107	1.1107	1.1107
Δy		0.0042	0.0103	0.0043	%AAD	0.804	1.959	0.492
T=303.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.7690	0.7690	0.7690	0.7690
0.0801	0.1211	0.1259	0.1319	0.1279	0.8118	0.8147	0.8380	0.8119
0.1911	0.2908	0.2796	0.2857	0.2826	0.8829	0.8845	0.9155	0.8839
0.3194	0.4504	0.4333	0.4347	0.4362	0.9739	0.9663	1.0008	0.9678
0.5018	0.6195	0.6183	0.6118	0.6201	1.0869	1.0852	1.1158	1.0888
0.6387	0.7414	0.7377	-	0.7386	1.1788	1.1767	-	1.1814
1.0000	1.0000	1.0000	1.0000	1.0000	1.4340	1.4340	1.4340	1.4340
Δy		0.0076	0.0098	0.0065	%AAD	0.331	3.085	0.229

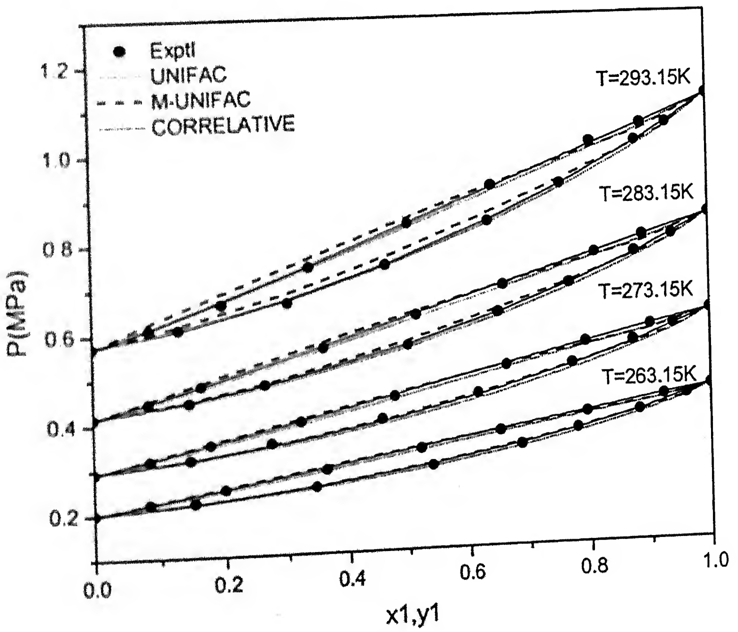

Figure 4.74 P-x-y diagram for R143a (1) / R134a (2) System using pure components as ref. fluids

Table 4.77 (Continued)

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=293.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.5718	0.5718	0.5718	0.5718
0.0857	0.1311	0.1411	0.1491	0.1431	0.6091	0.6103	0.6249	0.6126
0.1982	0.3036	0.3009	0.3090	0.3036	0.6642	0.6676	0.6886	0.6719
0.3384	0.4663	0.4688	0.4711	0.4713	0.7424	0.7399	0.7638	0.7461
0.5041	0.6377	0.6344	0.6289	0.6357	0.8339	0.8269	0.8479	0.8347
0.6444	0.7575	0.7538	0.7446	0.7543	0.9138	0.9020	0.9164	0.9108
0.8067	0.8804	0.8745	0.8658	0.8743	1.0074	0.9910	0.9938	1.0005
0.8896	0.9319	0.9304	0.9243	0.9302	1.0461	1.0374	1.0329	1.0473
1.0000	1.0000	1.0000	1.0000	1.0000	1.1107	1.1107	1.1107	1.1107
$\overline{\Delta y}$		0.0042	0.0103	0.0043	%AAD	0.804	1.959	0.492
T=303.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.7690	0.7690	0.7690	0.7690
0.0801	0.1211	0.1259	0.1319	0.1279	0.8118	0.8147	0.8380	0.8119
0.1911	0.2908	0.2796	0.2857	0.2826	0.8829	0.8845	0.9155	0.8839
0.3194	0.4504	0.4333	0.4347	0.4362	0.9739	0.9663	1.0008	0.9678
0.5018	0.6195	0.6183	0.6118	0.6201	1.0869	1.0852	1.1158	1.0888
0.6387	0.7414	0.7377	-	0.7386	1.1788	1.1767	-	1.1814
1.0000	1.0000	1.0000	1.0000	1.0000	1.4340	1.4340	1.4340	1.4340
$\overline{\Delta y}$		0.0076	0.0098	0.0065	%AAD	0.331	3.085	0.229

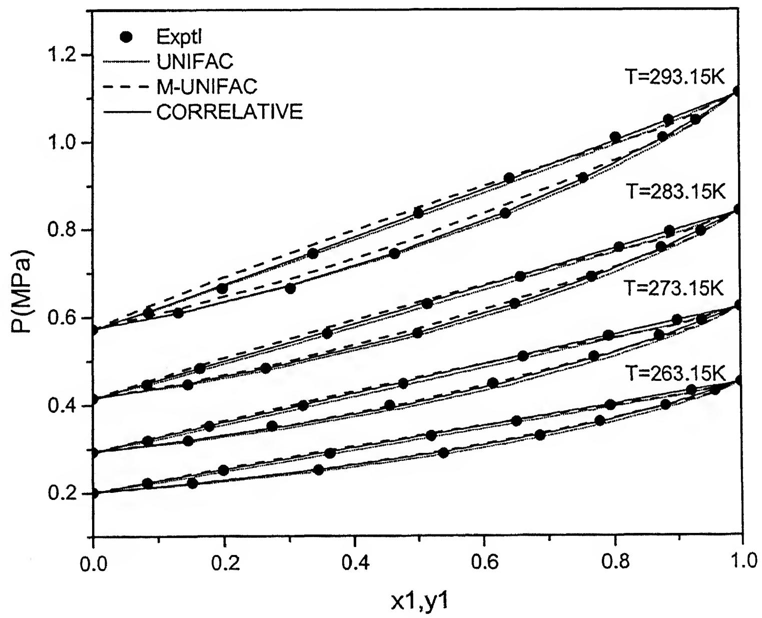

Figure 4.74 P-x-y diagram for R143a (1) / R134a (2) System using pure components as ref. fluids

Table 4.78 Results of VLE Calculations for R143a (1) / R152a (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=273.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.2628	0.2628	0.2628	0.2628
0.054	0.123	0.1381	0.1621	0.1255	0.2899	0.2273	0.2318	0.2926
0.108	0.234	0.2497	0.2816	0.2294	0.3165	0.2481	0.2577	0.3156
0.191	0.346	0.3857	0.4163	0.3595	0.3507	0.2786	0.2935	0.3492
0.449	0.638	0.6627	0.6673	0.6367	0.4508	0.3651	0.3834	0.4437
0.648	0.790	0.8049	0.7961	0.7860	0.5055	0.4269	0.4403	0.5102
0.902	0.952	0.9496	0.9423	0.9438	0.5969	0.5039	0.5061	0.5920
1.000	1.000	1.0000	1.0000	1.0000	0.6202	0.6202	0.6202	0.6202
$\overline{\Delta y}$		0.0187	0.0337	0.0057	%AAD	18.984	16.336	0.830
T=293.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.5171	0.5171	0.5171	0.5171
0.145	0.298	0.2805	0.3061	0.2648	0.6179	0.5262	0.5503	0.6110
0.437	0.639	0.6165	0.6207	0.5970	0.8044	0.6980	0.7351	0.7887
0.666	0.806	0.7925	0.7831	0.7785	0.9268	0.8229	0.8518	0.9157
0.782	0.879	0.8686	0.8580	0.8588	0.9916	0.8852	0.9060	0.9782
0.882	0.938	0.9302	0.9222	0.9246	1.0482	0.9389	0.9511	1.0318
0.947	0.970	0.9690	0.9647	0.9664	1.0832	0.9741	0.9796	1.0667
1.000	1.000	1.0000	1.0000	1.0000	1.1070	1.1070	1.1070	1.1070
$\overline{\Delta y}$		0.0121	0.0152	0.0234	%AAD	11.751	9.187	1.454
T=303.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.6887	0.6887	0.6887	0.6887
0.220	0.342	0.3690	0.3892	0.3535	0.8782	0.7766	0.8194	0.8734
0.378	0.513	0.5440	0.5520	0.5268	0.9992	0.8942	0.9455	0.9934
0.495	0.626	0.6490	0.6481	0.6330	1.0826	0.9778	1.0286	1.0780
0.700	0.793	0.8044	0.7945	0.7931	1.2312	1.1205	1.1604	1.2209
0.806	0.872	0.8762	0.8662	0.8684	1.3020	1.1938	1.2238	1.2936
0.912	0.941	0.9446	0.9384	0.9409	1.3718	1.2676	1.2849	1.3661
1.000	1.000	1.0000	1.0000	1.0000	1.4344	1.4344	1.4344	1.4344
$\overline{\Delta y}$		0.0167	0.0197	0.0060	%AAD	9.443	5.859	0.575
T=313.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.9058	0.9058	0.9058	0.9058
0.101	0.165	0.1841	0.2019	0.1758	1.0134	0.9154	0.9527	1.0249
0.174	0.268	0.2919	0.3109	0.2803	1.0935	0.9875	1.0392	1.0989
0.447	0.571	0.5904	0.5921	0.5762	1.3446	1.2409	1.3123	1.3567
0.606	0.707	0.7224	0.7153	0.7104	1.4912	1.3816	1.4476	1.4978
0.703	0.785	0.7951	0.7854	0.7853	1.5780	1.4666	1.5247	1.5823
0.855	0.898	0.9020	0.8937	0.8967	1.7072	1.6002	1.6394	1.7141
0.919	0.944	0.9455	0.9400	0.9424	1.7634	1.6571	1.6857	1.7697
1.000	1.000	1.0000	1.0000	1.0000	1.8270	1.8270	1.8270	1.8270
$\overline{\Delta y}$		0.0134	0.0168	0.0050	%AAD	7.684	4.0043	0.572

Table 4.79 Results of VLE Calculations for R143a (1) / R152a (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=273.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.2628	0.2628	0.2628	0.2628
0.054	0.123	0.1229	0.1442	0.1251	0.2899	0.2890	0.2937	0.2925
0.108	0.234	0.2253	0.2548	0.2289	0.3165	0.3109	0.3215	0.3155
0.191	0.346	0.3546	0.3838	0.3591	0.3507	0.3430	0.3599	0.3491
0.449	0.638	0.6323	0.6372	0.6363	0.4508	0.4334	0.4551	0.4436
0.648	0.790	0.7832	0.7740	0.7859	0.5055	0.4970	0.5136	0.5102
0.902	0.952	0.9429	0.9348	0.9437	0.5969	0.5749	0.5781	0.5920
1.000	1.000	1.0000	1.0000	1.0000	0.6202	0.6202	0.6202	0.6202
$\overline{\Delta y}$		0.0065	0.0190	0.0057	%AAD	2.247	1.871	0.842
T=293.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.5171	0.5171	0.5171	0.5171
0.145	0.298	0.2595	0.2836	0.2643	0.6179	0.6178	0.6443	0.6108
0.437	0.639	0.5915	0.5958	0.5966	0.8044	0.7909	0.8330	0.7884
0.666	0.806	0.7749	0.7653	0.7782	0.9268	0.9145	0.9483	0.9155
0.782	0.879	0.8564	0.8452	0.8586	0.9916	0.9752	1.0001	0.9780
0.882	0.938	0.9233	0.9146	0.9245	1.0482	1.0271	1.0417	1.0316
0.947	0.970	0.9658	0.9610	0.9663	1.0832	1.0608	1.0674	1.0664
1.000	1.000	1.0000	1.0000	1.0000	1.1070	1.1070	1.1070	1.1070
$\overline{\Delta y}$		0.0264	0.0274	0.0236	%AAD	1.460	2.181	1.479
T=303.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.6887	0.6887	0.6887	0.6887
0.220	0.342	0.3476	0.3669	0.3529	0.8782	0.8810	0.9281	0.8730
0.378	0.513	0.5209	0.5291	0.5264	0.9992	0.9976	1.0548	0.9931
0.495	0.626	0.6278	0.6270	0.6326	1.0826	1.0798	1.1369	1.0777
0.700	0.793	0.7898	0.7796	0.7929	1.2312	1.2183	1.2641	1.2207
0.806	0.872	0.8662	0.8557	0.8682	1.3020	1.2885	1.3231	1.2933
0.912	0.941	0.9399	0.9331	0.9407	1.3718	1.3583	1.3781	1.3658
1.000	1.000	1.0000	1.0000	1.0000	1.4344	1.4344	1.4344	1.4344
$\overline{\Delta y}$		0.0043	0.0133	0.0059	%AAD	0.635	3.502	0.603
T=313.15K								
0.000	0.000	0.0000	0.0000	0.0000	0.9058	0.9058	0.9058	0.9058
0.101	0.165	0.1719	0.1885	0.1753	1.0134	1.0312	1.0719	1.0246
0.174	0.268	0.2753	0.2933	0.2798	1.0935	1.1025	1.1587	1.0986
0.447	0.571	0.5710	0.5727	0.5757	1.3446	1.3503	1.4291	1.3562
0.606	0.707	0.7064	0.6993	0.7101	1.4912	1.4858	1.5594	1.4976
0.703	0.785	0.7823	0.7723	0.7850	1.5780	1.5668	1.6319	1.5822
0.855	0.898	0.8952	0.8865	0.8965	1.7072	1.6925	1.7363	1.7140
0.919	0.944	0.9416	0.9357	0.9423	1.7634	1.7453	1.7769	1.7696
1.000	1.000	1.0000	1.0000	1.0000	1.8270	1.8270	1.8270	1.8270
$\overline{\Delta y}$		0.0032	0.0130	0.0047	%AAD	0.853	4.068	0.554

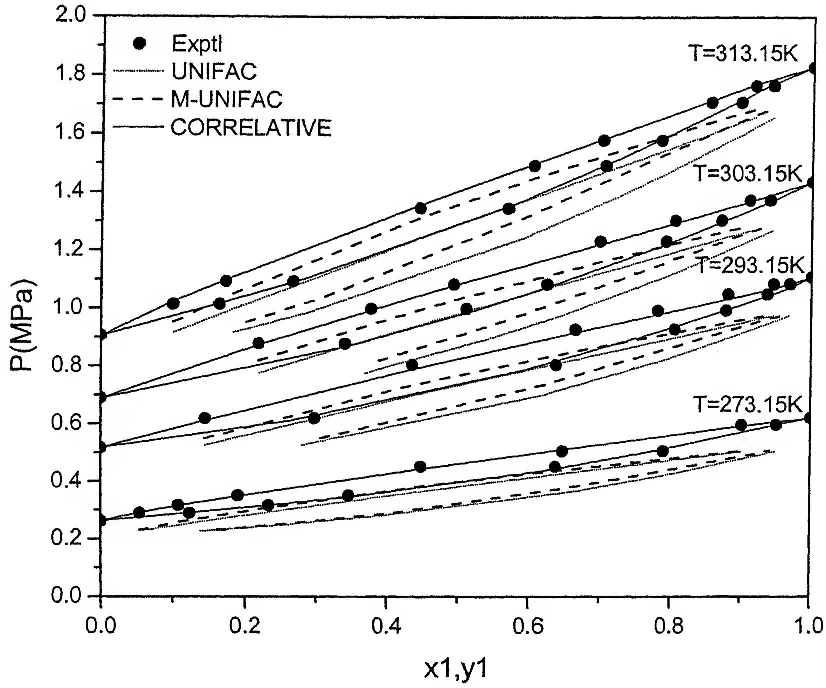

Figure 4.75 P-x-y diagram for R143a (1)/R152a (2) system using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

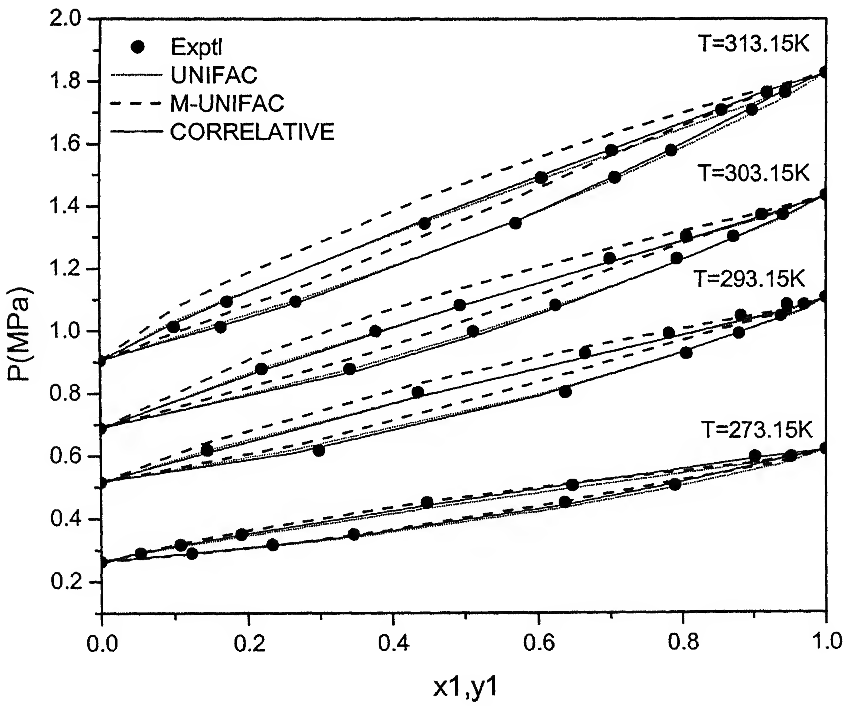

Figure 4.76 P-x-y diagram for R143a (1) / R152a (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

Table 4.81 Results of VLE Calculations for R143a (1) / R236fa (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=283.11K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.1609	0.1609	0.1609	0.1609
0.0752	0.2460	0.2075	0.2390	0.2543	0.2001	0.2356	0.2456	0.2025
0.2399	0.5543	0.5040	0.5327	0.5725	0.2939	0.3185	0.3434	0.3002
0.3292	0.6642	0.6123	0.6306	0.6766	0.3486	0.3652	0.3937	0.3564
0.4799	0.7897	0.7473	0.7507	0.7977	0.4480	0.4464	0.4759	0.4557
0.6302	0.8753	0.8443	0.8390	0.8790	0.5523	0.5303	0.5560	0.5597
0.7608	0.9288	0.9093	0.9017	0.9308	0.6481	0.6055	0.6253	0.6538
0.8658	0.6934	0.9527	0.9467	0.9643	0.7314	0.6676	0.6821	0.7321
1.0000	1.0000	1.0000	1.0000	1.0000	0.8348	0.8348	0.8348	0.8348
$\overline{\Delta y}$		0.0704	0.0597	0.0462	%AAD	7.215	9.950	1.137
T=298.16K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.2725	0.2725	0.2725	0.2725
0.1410	0.3618	0.3257	0.3572	0.3721	0.3830	0.4274	0.4518	0.3865
0.2746	0.5672	0.5253	0.5476	0.5775	0.4959	0.5299	0.5678	0.5033
0.4009	0.6983	0.6598	0.6695	0.7065	0.6108	0.6307	0.6738	0.6203
0.5231	0.7905	0.7587	0.7587	0.7965	0.7297	0.7318	0.7742	0.7394
0.6312	0.8536	0.8290	0.8237	0.8579	0.8403	0.8242	0.8625	0.8495
0.7563	0.9122	0.8963	0.8889	0.9148	0.9746	0.9349	0.9658	0.9822
0.8649	0.9545	0.9460	0.9400	0.9559	1.0996	1.0348	1.0575	1.1030
1.0000	1.0000	1.0000	1.0000	1.0000	1.2607	1.2607	1.2607	1.2607
$\overline{\Delta y}$		0.0282	0.0218	0.0062	%AAD	4.837	8.036	1.067
T=313.21K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.4393	0.4393	0.4393	0.4393
0.1158	0.2860	0.2601	0.2867	0.2896	0.5589	0.6210	0.6472	0.5624
0.2774	0.5319	0.5034	0.5230	0.5419	0.7468	0.7974	0.8475	0.7552
0.4319	0.6900	0.6629	0.6690	0.6974	0.9446	0.9755	1.0335	0.9541
0.5694	0.7922	0.7698	0.7670	0.7967	1.1325	1.1423	1.1978	1.1430
0.7409	0.8890	0.8745	0.8675	0.8907	1.3883	1.3625	1.4063	1.3958
0.8518	0.9395	0.9316	0.9256	0.9405	1.5676	1.5140	1.5463	1.5715
0.8869	0.9548	0.9484	0.9434	0.9551	1.6294	1.5636	1.5919	1.6295
1.0000	1.0000	1.0000	1.0000	1.0000	1.8325	1.8325	1.8325	1.8325
$\overline{\Delta y}$		0.0190	0.0147	0.0041	%AAD	0.019	7.059	0.004

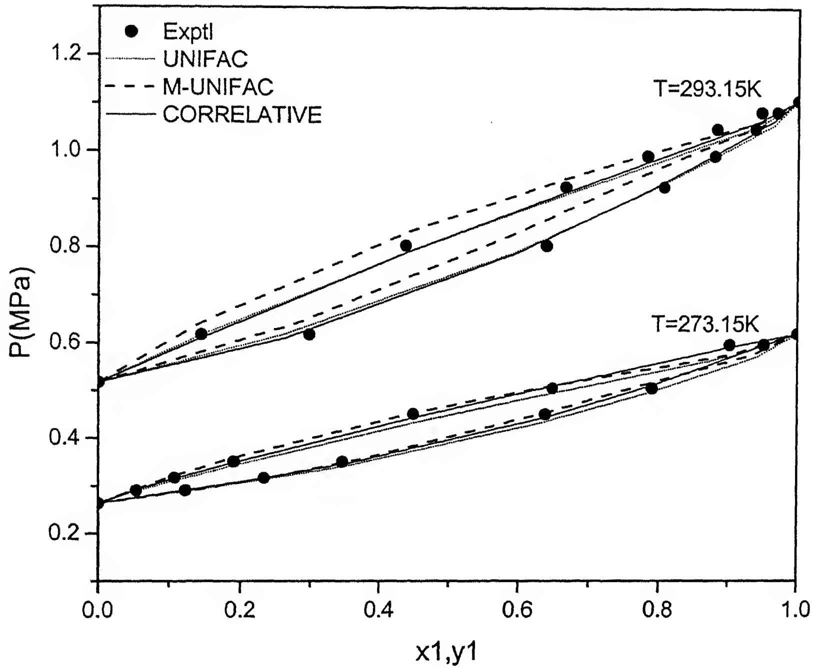

Figure 4.77 P-x-y diagram for R143a (1) / R152a (2) System using pure components as ref. fluids

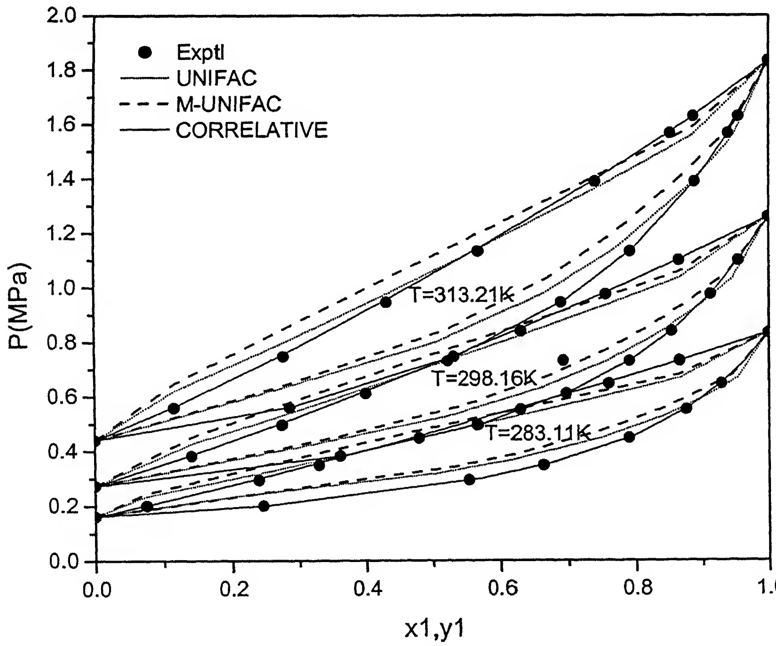

Figure 4.78 P-x-y diagram for R143a (1)/R236fa (2) system using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

Table 4.82 Results of VLE Calculations for R143a (1) / R236fa (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=283.11K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.1609	0.1609	0.1609	0.1609
0.0752	0.2460	0.2591	0.2987	0.2541	0.2001	0.2031	0.2145	0.2024
0.2399	0.5543	0.5763	0.6046	0.5731	0.2939	0.3024	0.3294	0.3003
0.3292	0.6642	0.6785	0.6952	0.6770	0.3486	0.3587	0.3891	0.3567
0.4799	0.7897	0.7974	0.7997	0.7979	0.4480	0.4570	0.4872	0.4561
0.6302	0.8753	0.8775	0.8729	0.8788	0.5523	0.5588	0.5844	0.5598
0.7608	0.9288	0.9292	0.9233	0.9304	0.6481	0.6503	0.6705	0.6531
0.8658	0.6934	0.9631	0.9587	0.9639	0.7314	0.7262	0.7419	0.7307
1.0000	1.0000	1.0000	1.0000	1.0000	0.8348	0.8348	0.8348	0.8348
$\overline{\Delta y}$		0.0471	0.0600	0.0462	%AAD	1.643	7.188	1.384
T=298.16K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.2725	0.2725	0.2725	0.2725
0.1410	0.3618	0.3739	0.4092	0.3708	0.3830	0.3888	0.4150	0.3861
0.2746	0.5672	0.5779	0.5999	0.5769	0.4959	0.5060	0.5456	0.5028
0.4009	0.6983	0.7056	0.7140	0.7062	0.6108	0.6224	0.6660	0.6201
0.5231	0.7905	0.7948	0.7942	0.7963	0.7297	0.7397	0.7817	0.7392
0.6312	0.8536	0.8559	0.8511	0.8577	0.8403	0.8473	0.8849	0.8490
0.7563	0.9122	0.9131	0.9069	0.9146	0.9746	0.9768	1.0074	0.9814
0.8649	0.9545	0.9547	0.9500	0.9557	1.0996	1.0943	1.1183	1.1016
1.0000	1.0000	1.0000	1.0000	1.0000	1.2607	1.2607	1.2607	1.2607
$\overline{\Delta y}$		0.0054	0.0160	0.0057	%AAD	1.191	6.412	0.993
T=313.21K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.4393	0.4393	0.4393	0.4393
0.1158	0.2860	0.2893	0.3197	0.2876	0.5589	0.5663	0.5938	0.5617
0.2774	0.5319	0.5406	0.5603	0.5409	0.7468	0.7590	0.8099	0.7538
0.4319	0.6900	0.6953	0.7005	0.6971	0.9446	0.9562	1.0133	0.9530
0.5694	0.7922	0.7945	0.7915	0.7967	1.1325	1.1423	1.1960	1.1425
0.7409	0.8890	0.8888	0.8824	0.8906	1.3883	1.3900	1.4324	1.3958
0.8518	0.9395	0.9392	0.9342	0.9404	1.5676	1.5615	1.5945	1.5718
0.8869	0.9548	0.9541	0.9499	0.9550	1.6294	1.6182	1.6480	1.6299
1.0000	1.0000	1.0000	1.0000	1.0000	1.8325	1.8325	1.8325	1.8325
$\overline{\Delta y}$		0.0030	0.0129	0.0036	%AAD	0.893	4.804	0.580

Table 4.83 Results of VLE Calculations for R143a (1) / R236fa (2) System using Pure components as ref. fluids

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=283.11K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.1609	0.1609	0.1609	0.1609
0.0752	0.2460	0.2593	0.2992	0.2547	0.2001	0.2028	0.2142	0.2024
0.2399	0.5543	0.5762	0.6046	0.5734	0.2939	0.3017	0.3288	0.3005
0.3292	0.6642	0.6783	0.6948	0.6772	0.3486	0.3578	0.3880	0.3569
0.4799	0.7897	0.7970	0.7993	0.7978	0.4480	0.4555	0.4856	0.4561
0.6302	0.8753	0.8772	0.8726	0.8786	0.5523	0.5566	0.5822	0.5597
0.7608	0.9288	0.9290	0.9231	0.9303	0.6481	0.6475	0.6677	0.6530
0.8658	0.6934	0.9630	0.9586	0.9639	0.7314	0.7230	0.7387	0.7305
1.0000	1.0000	1.0000	1.0000	1.0000	0.8348	0.8348	0.8348	0.8348
$\overline{\Delta y}$		0.0469	0.0596	0.0463	%AAD	1.474	6.861	1.402
T=298.16K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.2725	0.2725	0.2725	0.2725
0.1410	0.3618	0.3735	0.4089	0.3709	0.3830	0.3881	0.4143	0.3862
0.2746	0.5672	0.5775	0.5994	0.5769	0.4959	0.5048	0.5442	0.5029
0.4009	0.6983	0.7051	0.7135	0.7061	0.6108	0.6206	0.6640	0.6199
0.5231	0.7905	0.7944	0.7938	0.7962	0.7297	0.7372	0.7791	0.7389
0.6312	0.8536	0.8556	0.8508	0.8576	0.8403	0.8443	0.8817	0.8488
0.7563	0.9122	0.9129	0.9068	0.9146	0.9746	0.9732	1.0037	0.9813
1.0000	1.0000	1.0000	1.0000	1.0000	1.2607	1.2607	1.2607	1.2607
$\overline{\Delta y}$		0.0059	0.0177	0.0064	%AAD	1.065	6.884	1.116
T=313.21K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.4393	0.4393	0.4393	0.4393
0.1158	0.2860	0.2888	0.3191	0.2874	0.5589	0.5656	0.5931	0.5617
0.2774	0.5319	0.5400	0.5597	0.5407	0.7468	0.7575	0.8083	0.7535
0.4319	0.6900	0.6948	0.7001	0.6970	0.9446	0.9538	1.0108	0.9527
1.0000	1.0000	1.0000	1.0000	1.0000	1.8325	1.8325	1.8325	1.8325
$\overline{\Delta y}$		0.0052	0.0237	0.0057	%AAD	1.203	7.118	0.752

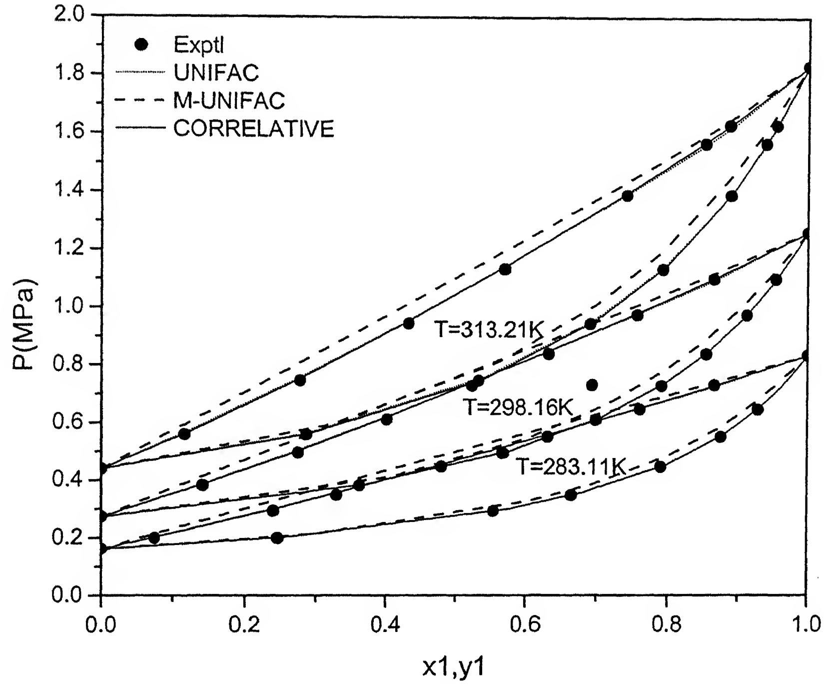

Figure 4.79 P-x-y diagram for R143a (1) / R236fa (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

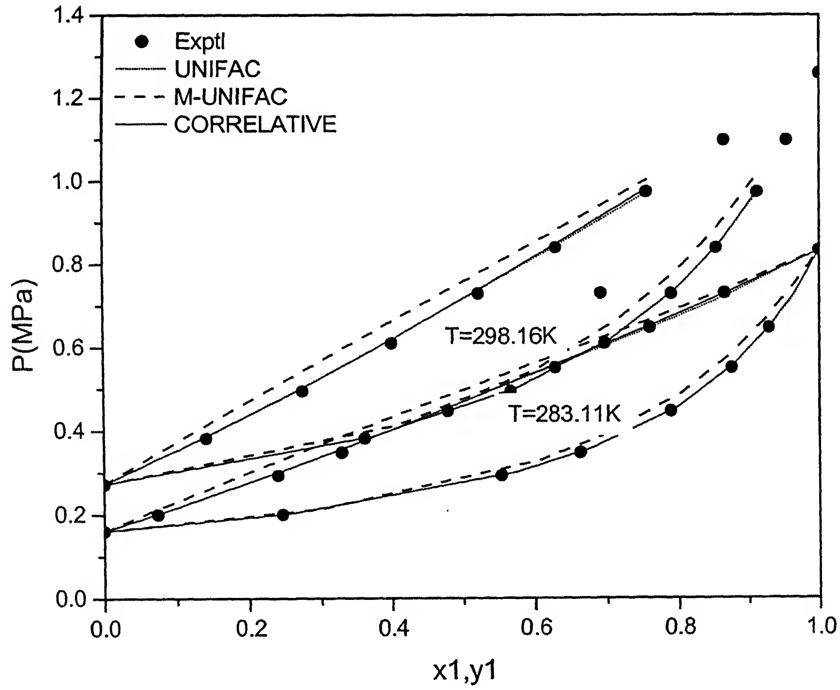

Figure 4.80 P-x-y diagram for R143a (1) / R236fa (2) System using pure components as ref. fluids

Table 4.84 Results of VLE Calculations for R227ea (1) / R600a (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRE LATIVE	Exptl	UNIFAC	M-UNIFAC	CORRE LATIVE
T=303.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.4070	0.4070	0.4070	0.4070
0.0199	0.0838	0.1223	0.1869	0.0653	0.4416	0.4913	0.5404	0.4416
0.0975	0.2530	0.3625	0.4671	0.2398	0.5214	0.6584	0.8180	0.5152
0.1584	0.3331	0.4451	0.5375	0.3256	0.5680	0.7370	0.9263	0.5566
0.2365	0.4018	0.5010	0.5712	0.4024	0.6003	0.7938	0.9820	0.5945
0.3783	0.4878	0.5454	0.5744	0.4944	0.6314	0.8332	0.9883	0.6340
0.4649	0.5309	0.5588	0.5636	0.5371	0.6470	0.8404	0.9808	0.6463
0.5883	0.5937	0.5756	0.5472	0.5941	0.6566	0.8431	0.9784	0.6533
0.6061	0.6031	0.5785	0.5453	0.6026	0.6582	0.8429	0.9789	0.6533
0.6978	0.6456	0.5988	0.5403	0.6509	0.6442	0.8371	0.9811	0.6490
0.7929	0.7066	0.6377	0.5532	0.7148	0.6308	0.8150	0.9679	0.6341
0.8575	0.7682	0.6861	0.5869	0.7733	0.6140	0.7799	0.9266	0.6149
0.9095	0.8459	0.7510	0.6479	0.8351	0.5880	0.7305	0.8516	0.5918
0.9631	0.9181	0.8656	0.7871	0.9210	0.5597	0.6490	0.7079	0.5583
1.0000	1.0000	1.0000	1.0000	1.0000	0.5257	0.5257	0.5257	0.5257
$\overline{\Delta y}$		0.0641	0.1295	0.0066	%AAD	26.475	49.208	0.634
T=313.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.5300	0.5300	0.5300	0.5300
0.0249	0.0849	0.1305	0.1911	0.0753	0.5804	0.6597	0.7293	0.5806
0.0967	0.2375	0.3331	0.4258	0.2283	0.6694	0.8426	1.0258	0.6645
0.1975	0.3568	0.4526	0.5267	0.3574	0.7504	0.9855	1.2142	0.7449
0.2822	0.4221	0.5001	0.5515	0.4287	0.7878	1.0435	1.2613	0.7886
0.4084	0.4986	0.5382	0.5556	0.5062	0.8260	1.0803	1.2681	0.8276
0.5002	0.5481	0.5572	0.5512	0.5532	0.8384	1.0902	1.2654	0.8426
0.5907	0.5969	0.5759	0.5478	0.5987	0.8440	1.0923	1.2652	0.8485
0.6095	0.6103	0.5803	0.5476	0.6085	0.8446	1.0917	1.2653	0.8487
0.6259	0.6162	0.5845	0.5477	0.6172	0.8456	1.0909	1.2652	0.8485
0.6879	0.6566	0.6028	0.5506	0.6524	0.8426	1.0840	1.2630	0.8448
0.7917	0.7319	0.6507	0.5729	0.7240	0.8254	1.0505	1.2352	0.8255
0.8820	0.8222	0.7303	0.6377	0.8109	0.7890	0.9764	1.1358	0.7891
0.9555	0.9160	0.8588	0.7850	0.9137	0.7430	0.8563	0.9334	0.7389
1.0000	1.0000	1.0000	1.0000	1.0000	0.7015	0.7015	0.7015	0.7015
$\overline{\Delta y}$		0.0562	0.1088	0.0053	%AAD	26.673	47.979	0.343

Table 4.84 (Continued)

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=323.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.6832	0.6832	0.6832	0.6832
0.1059	0.2427	0.3214	0.4012	0.2328	0.8666	1.0937	1.3182	0.8557
0.2306	0.3752	0.4504	0.5082	0.3780	0.9752	1.2873	1.5634	0.9705
0.3548	0.4625	0.5081	0.5350	0.4697	1.0354	1.3667	1.6188	1.0365
0.5007	0.5457	0.5508	0.5438	0.5527	1.0690	1.4003	1.6282	1.0759
0.6107	0.6118	0.5826	0.5519	0.6127	1.0806	1.4026	1.6271	1.0852
0.6239	0.6201	0.5869	0.5534	0.6202	1.0809	1.4014	1.6262	1.0852
0.6411	0.6291	0.5927	0.5555	0.6302	1.0778	1.3994	1.6246	1.0847
0.7202	0.6854	0.6249	0.5703	0.6801	1.0706	1.3801	1.6081	1.0762
0.8111	0.7592	0.6797	0.6063	0.7501	1.0470	1.3266	1.5474	1.0500
0.8787	0.8258	0.7447	0.6634	0.8171	1.0128	1.2494	1.4375	1.0151
0.9337	0.8933	0.8275	0.7540	0.8868	0.9752	1.1489	1.2733	0.9734
1.0000	1.0000	1.0000	1.0000	1.0000	0.9167	0.9167	0.9167	0.9167
$\overline{\Delta y}$		0.0537	0.1033	0.0053	%AAD	27.934	49.394	0.470

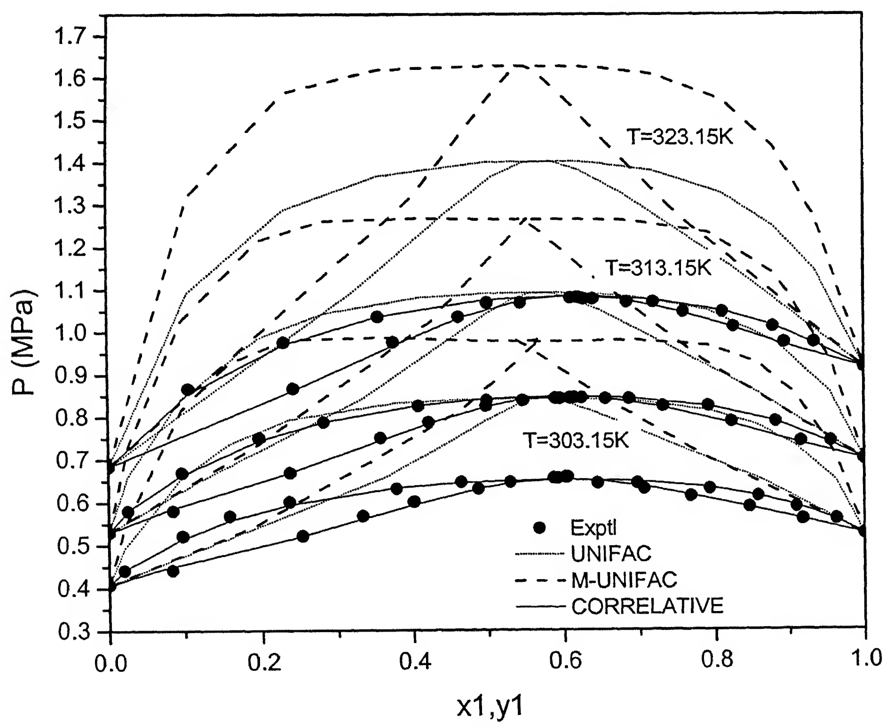

Figure 4.81 P-x-y diagram for R227ea (1)/R600a (2) system using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

Table 4.85 Results of VLE Calculations for R227ea (1) / R600a (2) System using ‘Ar’ and ‘R134a’ as ref. fluids and scaling factor ω

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=303.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.4070	0.4070	0.4070	0.4070
0.0199	0.0838	0.1042	0.1570	0.0621	0.4416	0.4670	0.5057	0.4420
0.0975	0.2530	0.3294	0.4247	0.2340	0.5214	0.6022	0.7277	0.5125
0.1584	0.3331	0.4148	0.5016	0.3217	0.5680	0.6689	0.8218	0.5536
0.2365	0.4018	0.4761	0.5440	0.4014	0.6003	0.7198	0.8773	0.5922
0.3783	0.4878	0.5276	0.5569	0.4972	0.6314	0.7567	0.8928	0.6335
0.4649	0.5309	0.5426	0.5486	0.5407	0.6470	0.7630	0.8884	0.6465
0.5883	0.5937	0.5583	0.5307	0.5972	0.6566	0.7644	0.8875	0.6541
0.6061	0.6031	0.5607	0.5281	0.6055	0.6582	0.7641	0.8882	0.6542
0.6978	0.6456	0.5774	0.5184	0.6518	0.6442	0.7587	0.8934	0.6504
0.7929	0.7066	0.6109	0.5231	0.7130	0.6308	0.7391	0.8880	0.6360
0.8575	0.7682	0.6559	0.5496	0.7696	0.6140	0.7064	0.8552	0.6169
0.9095	0.8459	0.7199	0.6054	0.8307	0.5880	0.6583	0.7860	0.5933
0.9631	0.9181	0.8425	0.7488	0.9177	0.5597	0.5751	0.6408	0.5581
1.0000	1.0000	1.0000	1.0000	1.0000	0.5257	0.5257	0.5257	0.5257
$\overline{\Delta y}$		0.0661	0.1323	0.0082	%AAD	14.913	35.430	0.809
T=313.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.5300	0.5300	0.5300	0.5300
0.0249	0.0849	0.1142	0.1648	0.0721	0.5804	0.6311	0.6883	0.5809
0.0967	0.2375	0.3063	0.3903	0.2232	0.6694	0.7834	0.9328	0.6616
0.1975	0.3568	0.4304	0.5005	0.3551	0.7504	0.9090	1.1023	0.7418
0.2822	0.4221	0.4828	0.5327	0.4290	0.7878	0.9627	1.1526	0.7866
0.4084	0.4986	0.5253	0.5432	0.5089	0.8260	0.9969	1.1658	0.8273
0.5002	0.5481	0.5451	0.5400	0.5564	0.8384	1.0051	1.1643	0.8430
0.5907	0.5969	0.5626	0.5350	0.6011	0.8440	1.0057	1.1645	0.8494
0.6095	0.6103	0.5665	0.5342	0.6106	0.8446	1.0050	1.1649	0.8496
0.6259	0.6162	0.5702	0.5335	0.6190	0.8456	1.0041	1.1652	0.8495
0.6879	0.6566	0.5861	0.5331	0.6530	0.8426	0.9975	1.1653	0.8462
0.7917	0.7319	0.6288	0.5473	0.7220	0.8254	0.9668	1.1472	0.8274
0.8820	0.8222	0.7046	0.6034	0.8069	0.7890	0.8962	1.0606	0.7907
0.9555	0.9160	0.8385	0.7518	0.9104	0.7430	0.7749	0.8596	0.7383
1.0000	1.0000	1.0000	1.0000	1.0000	0.7015	0.7015	0.7015	0.7015
$\overline{\Delta y}$		0.0581	0.1117	0.0074	%AAD	16.921	36.327	0.496

Table 4.85 (Continued)

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=323.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.6832	0.6832	0.6832	0.6832
0.1059	0.2427	0.3005	0.3729	0.2282	0.8666	1.0308	1.2204	0.8528
0.2306	0.3752	0.4350	0.4900	0.3767	0.9752	1.2060	1.4483	0.9678
0.3548	0.4625	0.4979	0.5246	0.4711	1.0354	1.2805	1.5092	1.0357
0.5007	0.5457	0.5424	0.5360	0.5551	1.0690	1.3101	1.5200	1.0766
0.6107	0.6118	0.5724	0.5417	0.6143	1.0806	1.3102	1.5190	1.0866
0.6239	0.6201	0.5763	0.5426	0.6216	1.0809	1.3090	1.5185	1.0866
0.6411	0.6291	0.5816	0.5441	0.6313	1.0778	1.3070	1.5173	1.0862
0.7202	0.6854	0.6106	0.5542	0.6796	1.0706	1.2886	1.5058	1.0780
0.8111	0.7592	0.6611	0.5832	0.7475	1.0470	1.2386	1.4569	1.0521
0.8787	0.8258	0.7240	0.6348	0.8133	1.0128	1.1639	1.3572	1.0165
0.9337	0.8933	0.8087	0.7245	0.8833	0.9752	1.0632	1.1958	0.9730
1.0000	1.0000	1.0000	1.0000	1.0000	0.9167	0.9167	0.9167	0.9167
$\overline{\Delta y}$		0.0588	0.1106	0.0073	%AAD	19.552	39.596	0.611

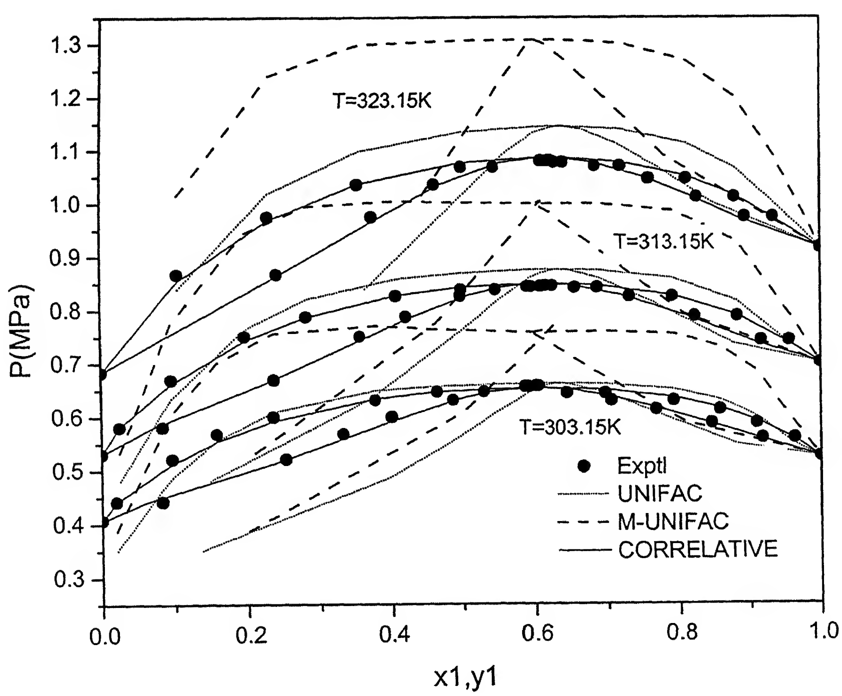

Figure 4.82 P-x-y diagram for R227ea (1) / R600a (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

Table 4.86 Results of VLE Calculations for R227ea (1) / R600a (2) System using Pure components as ref. fluids

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=303.15K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.4070	0.4070	0.4070	0.4070
0.0199	0.0838	0.1051	0.1586	0.0617	0.4416	0.4675	0.5066	0.4420
0.0975	0.2530	0.3323	0.4287	0.2335	0.5214	0.6050	0.7331	0.5122
0.1584	0.3331	0.4184	0.5064	0.3214	0.5680	0.6735	0.8300	0.5534
0.2365	0.4018	0.4802	0.5485	0.4014	0.6003	0.7259	0.8867	0.5921
0.3783	0.4878	0.5313	0.5606	0.4974	0.6314	0.7635	0.9017	0.6335
0.4649	0.5309	0.5460	0.5519	0.5409	0.6470	0.7700	0.8969	0.6466
0.5883	0.5937	0.5615	0.5340	0.5973	0.6566	0.7716	0.8957	0.6541
0.6061	0.6031	0.5640	0.5314	0.6054	0.6582	0.7713	0.8964	0.6542
0.6978	0.6456	0.5806	0.5219	0.6518	0.6442	0.7660	0.9013	0.6504
0.7929	0.7066	0.6141	0.5265	0.7129	0.6308	0.7466	0.8960	0.6361
0.8575	0.7682	0.6587	0.5528	0.7695	0.6140	0.7142	0.8634	0.6170
0.9095	0.8459	0.7224	0.6081	0.8305	0.5880	0.6662	0.7946	0.5933
0.9631	0.9181	0.8440	0.7503	0.9175	0.5597	0.5829	0.6492	0.5581
1.0000	1.0000	1.0000	1.0000	1.0000	0.5257	0.5257	0.5257	0.5257
$\overline{\Delta y}$		0.0660	0.1324	0.0084	%AAD	15.926	36.683	0.819

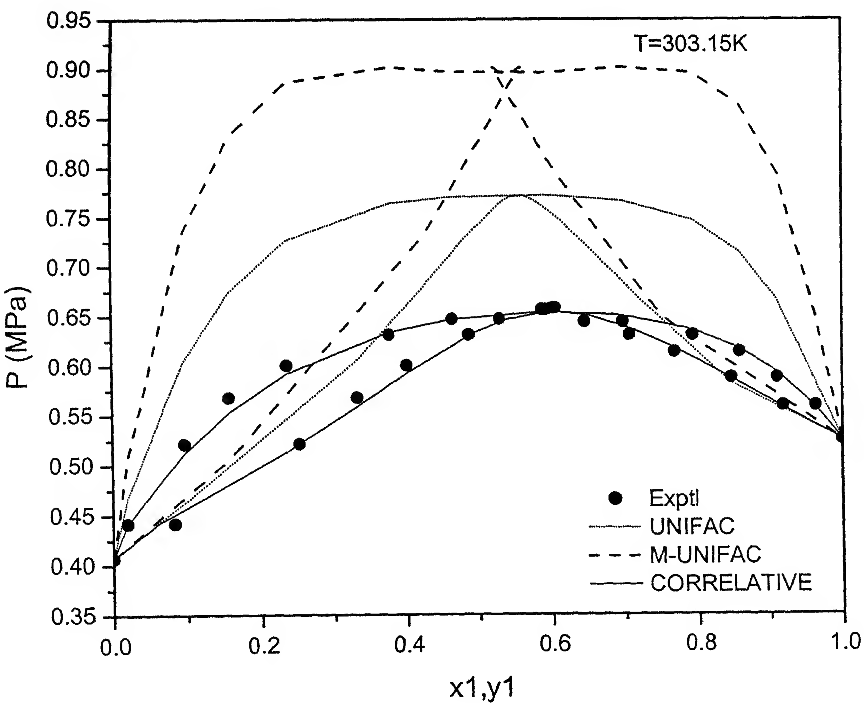

Figure 4.83 P-x-y diagram for R227ea (1) / R600a (2) System using pure components as ref. fluids

Table 4.87 Results of VLE Calculations for R290 (1) / R236ea (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=283.12K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.1186	0.1186	0.1186	0.1186
0.0524	0.4627	0.4976	0.6328	0.5203	0.2221	0.3195	0.4432	0.2457
0.1150	0.6368	0.6429	0.7413	0.6692	0.3231	0.4424	0.6303	0.3492
0.2199	0.7402	0.7210	0.7809	0.7521	0.4293	0.5492	0.7371	0.4490
0.3433	0.7905	0.7524	0.7817	0.7891	0.5008	0.5993	0.7404	0.5059
0.5804	0.8401	0.7840	0.7657	0.8293	0.5732	0.6384	0.7148	0.5619
0.7538	0.8736	0.8259	0.7813	0.8704	0.6084	0.6638	0.7196	0.5996
0.7999	0.8849	0.8442	0.7958	0.8862	0.6160	0.6697	0.7203	0.6101
0.8460	0.9004	0.8671	0.8177	0.9050	0.6243	0.6744	0.7182	0.6204
0.8735	0.9111	0.8837	0.8356	0.9179	0.6287	0.6762	0.7147	0.6264
0.9269	0.9383	0.9233	0.8843	0.9474	0.6353	0.6768	0.7003	0.6373
0.9759	0.9754	0.9711	0.9533	0.9808	0.6375	0.6724	0.6741	0.6458
0.9893	0.9885	0.9867	0.9780	0.9913	0.6368	0.6701	0.6640	0.6477
1.0000	1.0000	1.0000	1.0000	1.0000	0.6357	0.6357	0.6357	0.6357
$\overline{\Delta y}$		0.0271	0.0687	0.0123	%AAD	15.862	35.256	2.753
T=298.16K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.2058	0.2058	0.2058	0.2058
0.0625	0.4232	0.4655	0.5878	0.4799	0.3573	0.5027	0.6700	0.3943
0.1305	0.5925	0.6027	0.6945	0.6227	0.4964	0.6679	0.9102	0.5340
0.2897	0.7255	0.7010	0.7431	0.7301	0.6871	0.8499	1.0699	0.7074
0.5942	0.8149	0.7666	0.7469	0.8067	0.8561	0.9614	1.0770	0.8427
0.7077	0.8450	0.7990	0.7631	0.8391	0.8956	0.9910	1.0880	0.8826
0.8352	0.8857	0.8567	0.8125	0.8904	0.9334	1.0164	1.0902	0.9259
0.8569	0.8934	0.8700	0.8264	0.9014	0.9386	1.0189	1.0867	0.9328
0.8843	0.9106	0.8887	0.8472	0.9166	0.9445	1.0208	1.0796	0.9410
0.9201	0.9315	0.9168	0.8814	0.9387	0.9508	1.0207	1.0643	0.9508
0.9410	0.9458	0.9355	0.9058	0.9530	0.9530	1.0191	1.0514	0.9558
0.9694	0.9690	0.9642	0.9458	0.9743	0.9551	1.0146	1.0283	0.9619
0.9898	0.9888	0.9874	0.9804	0.9911	0.9537	1.0094	1.0069	0.9654
1.0000	1.0000	1.0000	1.0000	1.0000	0.9512	0.9512	0.9512	0.9512
$\overline{\Delta y}$		0.0231	0.0633	0.0122	%AAD	14.481	29.688	2.33

Table 4.87 (Continued)

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=313.21K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.3404	0.3404	0.3404	0.3404
0.0353	0.2533	0.2883	0.3958	0.2920	0.4571	0.5984	0.7227	0.4781
0.0377	0.2622	0.3008	0.4095	0.3048	0.4649	0.6093	0.7405	0.4869
0.1084	0.4850	0.5104	0.6067	0.5215	0.6538	0.8688	1.1390	0.7007
0.2217	0.6273	0.6252	0.6840	0.6448	0.8718	1.1095	1.4206	0.9151
0.3722	0.7127	0.6855	0.7073	0.7134	1.0543	1.2632	1.5129	1.0714
0.5782	0.7848	0.7413	0.7251	0.7757	1.2146	1.3782	1.5548	1.2032
0.7986	0.8625	0.8305	0.7921	0.8614	1.3308	1.4641	1.5905	1.3190
0.8766	0.9013	0.8810	0.8448	0.9052	1.3599	1.4773	1.5729	1.3528
0.8938	0.9117	0.8943	0.8600	0.9163	1.3646	1.4780	1.5641	1.3593
0.9236	0.9310	0.9195	0.8903	0.9370	1.3710	1.4766	1.5435	1.3694
0.9492	0.9512	0.9436	0.9212	0.9564	1.3736	1.4725	1.5192	1.3767
0.9673	0.9668	0.9623	0.9463	0.9711	1.3741	1.4678	1.4978	1.3810
0.9852	0.9839	0.9823	0.9742	0.9865	1.3729	1.4614	1.4728	1.3844
1.0000	1.0000	1.0000	1.0000	1.0000	1.3694	1.3694	1.3694	1.3694
$\overline{\Delta y}$		0.0205	0.0625	0.0133	%AAD	16.194	31.948	2.115

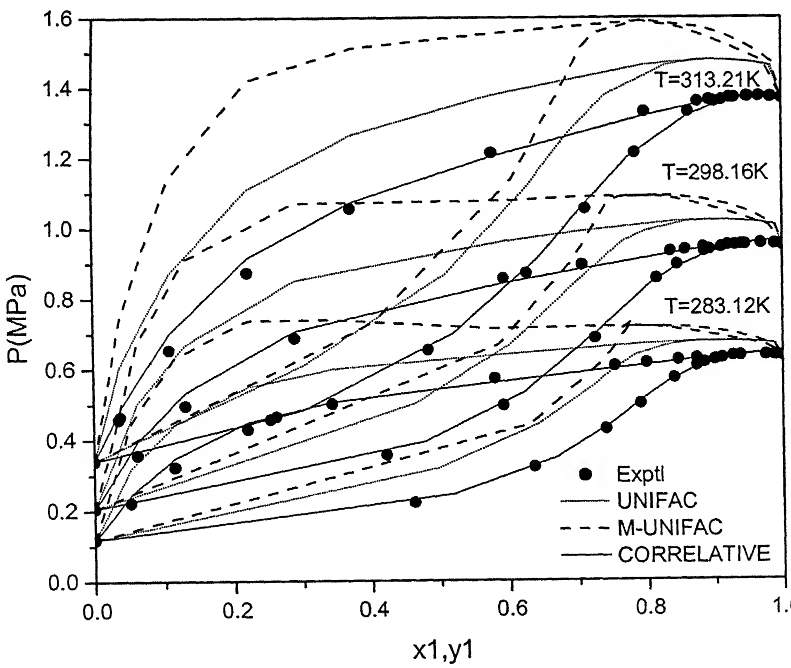

Figure 4.84 P-x-y diagram for R290 (1)/R236ea (2) system using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

Table 4.88 Results of VLE Calculations for R290 (1) / R236ea (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=283.12K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.1186	0.1186	0.1186	0.1186
0.0524	0.4627	0.6219	0.7496	0.5441	0.2221	0.2849	0.4376	0.2567
0.1150	0.6368	0.7410	0.8241	0.6833	0.3231	0.4124	0.6309	0.3633
0.2199	0.7402	0.7953	0.8436	0.7566	0.4293	0.5105	0.7090	0.4577
0.3433	0.7905	0.8138	0.8363	0.7879	0.5008	0.5491	0.6843	0.5069
0.5804	0.8401	0.8349	0.8181	0.8259	0.5732	0.5828	0.6452	0.5580
0.7538	0.8736	0.8705	0.8354	0.8700	0.6084	0.6170	0.6564	0.5973
0.7999	0.8849	0.8858	0.8491	0.8868	0.6160	0.6275	0.6614	0.6084
0.8460	0.9004	0.9045	0.8686	0.9064	0.6243	0.6380	0.6657	0.6195
0.8735	0.9111	0.9175	0.8836	0.9197	0.6287	0.6441	0.6674	0.6260
0.9269	0.9383	0.9472	0.9216	0.9494	0.6353	0.6553	0.6676	0.6380
0.9759	0.9754	0.9808	0.9700	0.9819	0.6375	0.6640	0.6621	0.6479
0.9893	0.9885	0.9913	0.9861	0.9918	0.6368	0.6660	0.6594	0.6503
1.0000	1.0000	1.0000	1.0000	1.0000	0.6357	0.6357	0.6357	0.6357
$\overline{\Delta y}$		0.0316	0.0669	0.0168	%AAD	8.831	28.931	3.912
T=298.16K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.2058	0.2058	0.2058	0.2058
0.0625	0.4232	0.5672	0.6902	0.4998	0.3573	0.4501	0.6488	0.4084
0.1305	0.5925	0.6866	0.7701	0.6344	0.4964	0.6180	0.8889	0.5506
0.2897	0.7255	0.7600	0.7957	0.7306	0.6871	0.7823	0.9996	0.7127
0.5942	0.8149	0.8095	0.7906	0.8032	0.8561	0.8844	0.9803	0.8378
0.7077	0.8450	0.8383	0.8072	0.8375	0.8956	0.9219	0.9977	0.8787
0.8352	0.8857	0.8888	0.8542	0.8914	0.9334	0.9654	1.0184	0.9241
0.8569	0.8934	0.8999	0.8665	0.9028	0.9386	0.9724	1.0202	0.9314
0.8843	0.9106	0.9153	0.8844	0.9183	0.9445	0.9807	1.0212	0.9402
0.9201	0.9315	0.9379	0.9125	0.9406	0.9508	0.9905	1.0194	0.9511
0.9410	0.9458	0.9524	0.9317	0.9547	0.9530	0.9956	1.0164	0.9569
0.9694	0.9690	0.9741	0.9617	0.9755	0.9551	1.0016	1.0095	0.9641
0.9898	0.9888	0.9910	0.9865	0.9916	0.9537	1.0051	1.0022	0.9686
1.0000	1.0000	1.0000	1.0000	1.0000	0.9512	0.9512	0.9512	0.9512
$\overline{\Delta y}$		0.0266	0.0587	0.0161	%AAD	8.363	23.550	3.177

Table 4.88 (Continued)

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=313.21K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.3404	0.3404	0.3404	0.3404
0.0353	0.2533	0.3647	0.4919	0.3096	0.4571	0.5168	0.6627	0.4883
0.0377	0.2622	0.3784	0.5057	0.3226	0.4649	0.5285	0.6826	0.4976
0.1084	0.4850	0.5859	0.6818	0.5346	0.6538	0.7972	1.0991	0.7198
0.2217	0.6273	0.6831	0.7373	0.6486	0.8718	1.0266	1.3443	0.9278
0.3722	0.7127	0.7301	0.7481	0.7110	1.0543	1.1626	1.3948	1.0712
0.5782	0.7848	0.7771	0.7605	0.7721	1.2146	1.2755	1.4262	1.1969
0.7986	0.8625	0.8586	0.8258	0.8617	1.3308	1.3896	1.4893	1.3151
0.8766	0.9013	0.9032	0.8742	0.9067	1.3599	1.4238	1.4967	1.3510
0.8938	0.9117	0.9145	0.8876	0.9179	1.3646	1.4302	1.4955	1.3580
0.9236	0.9310	0.9357	0.9135	0.9386	1.3710	1.4401	1.4902	1.3693
0.9492	0.9512	0.9555	0.9389	0.9578	1.3736	1.4471	1.4820	1.3779
0.9673	0.9668	0.9706	0.9589	0.9721	1.3741	1.4511	1.4738	1.3833
0.9852	0.9839	0.9863	0.9806	0.9871	1.3729	1.4543	1.4636	1.3880
1.0000	1.0000	1.0000	1.0000	1.0000	1.3694	1.3694	1.3694	1.3694
$\overline{\Delta y}$		0.0333	0.0752	0.0182	%AAD	9.041	25.065	2.920

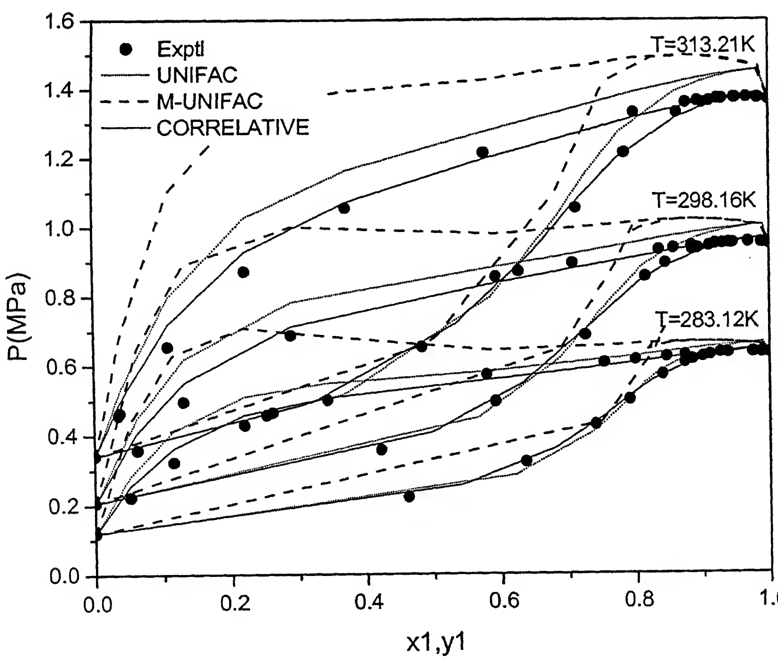

Figure 4.85 P-x-y diagram for R290 (1) / R236ea (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

Table 4.89 Results of VLE Calculations for R290 (1) / R236ea (2) System using Pure components as ref. fluids

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=283.12K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.1186	0.1186	0.1186	0.1186
0.0524	0.4627	0.6129	0.7403	0.5371	0.2221	0.2799	0.4240	0.2535
0.1150	0.6368	0.7360	0.8192	0.6793	0.3231	0.4063	0.6161	0.3594
0.2199	0.7402	0.7935	0.8419	0.7551	0.4293	0.5075	0.7028	0.4552
0.3433	0.7905	0.8137	0.8364	0.7879	0.5008	0.5494	0.6847	0.5062
0.5804	0.8401	0.8359	0.8193	0.8265	0.5732	0.5852	0.6479	0.5584
0.7538	0.8736	0.8712	0.8363	0.8702	0.6084	0.6197	0.6591	0.5975
0.7999	0.8849	0.8864	0.8498	0.8869	0.6160	0.6302	0.6642	0.6086
0.8460	0.9004	0.9049	0.8691	0.9064	0.6243	0.6408	0.6686	0.6196
0.8735	0.9111	0.9178	0.8839	0.9197	0.6287	0.6470	0.6703	0.6261
0.9269	0.9383	0.9474	0.9217	0.9493	0.6353	0.6582	0.6705	0.6380
0.9759	0.9754	0.9809	0.9700	0.9818	0.6375	0.6670	0.6650	0.6478
0.9893	0.9885	0.9913	0.9861	0.9917	0.6368	0.6690	0.6622	0.6502
1.0000	1.0000	1.0000	1.0000	1.0000	0.6357	0.6357	0.6357	0.6357
$\overline{\Delta y}$		0.0302	0.0653	0.0157	%AAD	8.730	28.231	3.612
T=298.16K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.2058	0.2058	0.2058	0.2058
0.0625	0.4232	0.5652	0.6871	0.4965	0.3573	0.4455	0.6383	0.4058
0.1305	0.5925	0.6866	0.7697	0.6328	0.4964	0.6142	0.8814	0.5479
0.2897	0.7255	0.7621	0.7977	0.7310	0.6871	0.7835	1.0017	0.7126
0.5942	0.8149	0.8116	0.7930	0.8038	0.8561	0.8878	0.9840	0.8387
0.7077	0.8450	0.8399	0.8090	0.8377	0.8956	0.9255	1.0012	0.8793
0.8352	0.8857	0.8897	0.8552	0.8913	0.9334	0.9695	1.0224	0.9245
0.8569	0.8934	0.9007	0.8675	0.9027	0.9386	0.9766	1.0244	0.9317
0.8843	0.9106	0.9160	0.8853	0.9181	0.9445	0.9851	1.0255	0.9405
0.9201	0.9315	0.9383	0.9131	0.9404	0.9508	0.9952	1.0240	0.9512
0.9410	0.9458	0.9527	0.9321	0.9546	0.9530	1.0005	1.0211	0.9570
0.9694	0.9690	0.9742	0.9619	0.9754	0.9551	1.0067	1.0144	0.9640
0.9898	0.9888	0.9911	0.9866	0.9915	0.9537	1.0103	1.0073	0.9685
1.0000	1.0000	1.0000	1.0000	1.0000	0.9512	0.9512	0.9512	0.9512
$\overline{\Delta y}$		0.0266	0.0579	0.0156	%AAD	8.557	23.554	3.047

Table 4.89 (Continued)

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=313.21K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.3404	0.3404	0.3404	0.3404
0.0353	0.2533	0.3671	0.4935	0.3081	0.4571	0.5122	0.6563	0.4873
0.0377	0.2622	0.3809	0.5073	0.3211	0.4649	0.5239	0.6760	0.4966
0.1084	0.4850	0.5899	0.6852	0.5342	0.6538	0.7948	1.0966	0.7190
0.2217	0.6273	0.6876	-	0.6492	0.8718	1.0285	-	0.9290
0.3722	0.7127	-	-	0.7118	1.0543	-	-	1.0737
1.0000	1.0000	1.0000	1.0000	1.0000	1.3694	1.3694	1.3694	1.3694
$\overline{\Delta y}$		0.0994	0.2285	0.0371	%AAD	16.077	52.241	6.361

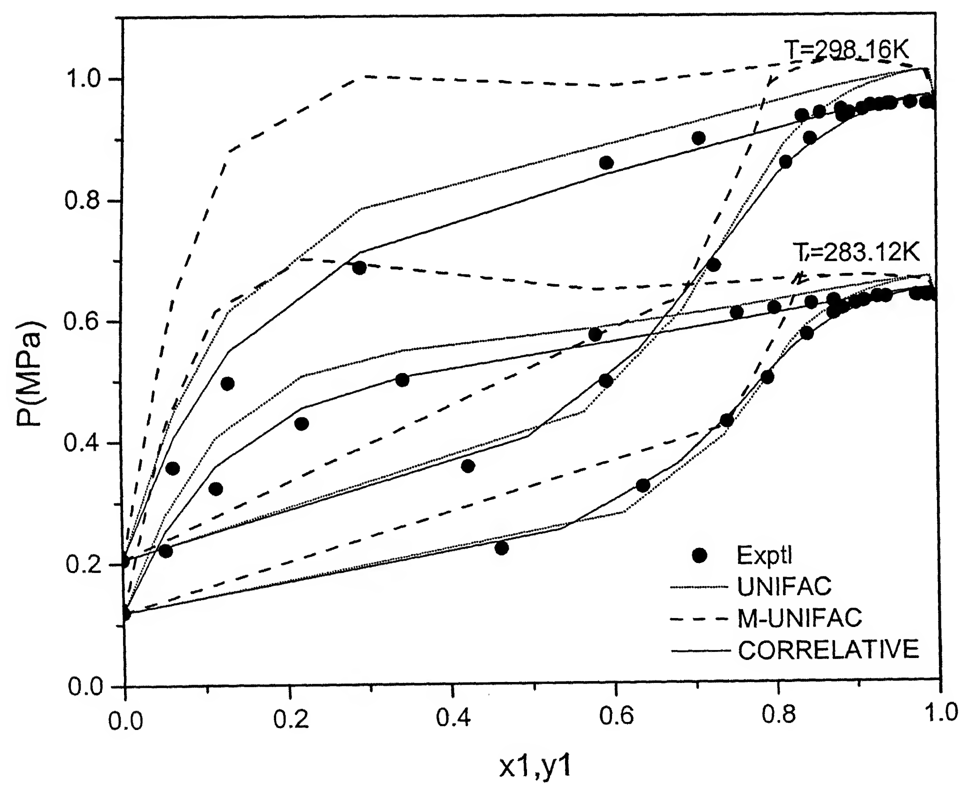

Figure 4.86 P-x-y diagram for R290 (1) / R236ea (2) System using pure components as ref. fluids

Table 4.90 Results of VLE Calculations for R600a (1) / R236fa (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=303.68K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.3258	0.3258	0.3258	0.3258
0.0612	0.2007	0.2475	0.1735	0.2150	0.3896	0.4771	0.4455	0.3950
0.1199	0.3023	0.3561	0.2726	0.3240	0.4365	0.5419	0.4869	0.4428
0.2192	0.4084	0.4438	0.3732	0.4243	0.4833	0.5992	0.5298	0.4909
0.2645	0.4434	0.4660	0.4047	0.4534	0.4980	0.6127	0.5420	0.5042
0.3297	0.4818	0.4888	0.4415	0.4862	0.5135	0.6247	0.5542	0.5176
0.3876	0.5100	0.5038	0.4689	0.5099	0.5232	0.6308	0.5611	0.5256
0.4897	0.5528	0.5257	0.5124	0.5465	0.5327	0.6358	0.5672	0.5336
0.5509	0.5766	0.5391	0.5383	0.5684	0.5354	0.6362	0.5675	0.5356
0.6625	0.6240	0.5707	0.5918	0.6147	0.5352	0.6310	0.5613	0.5335
0.7148	0.6511	0.5919	0.6224	0.6419	0.5309	0.6241	0.5544	0.5292
0.8099	0.7073	0.6504	0.6949	0.7082	0.5172	0.5984	0.5327	0.5127
0.8979	0.7914	0.7485	0.7957	0.8032	0.4865	0.5489	0.4971	0.4826
0.9579	0.8922	0.8666	0.8988	0.9020	0.4494	0.4925	0.4607	0.4499
1.0000	1.0000	1.0000	1.0000	1.0000	0.4107	0.4107	0.4107	0.4107
$\overline{\Delta y}$		0.0365	0.0288	0.0094	%AAD	19.045	6.844	0.735

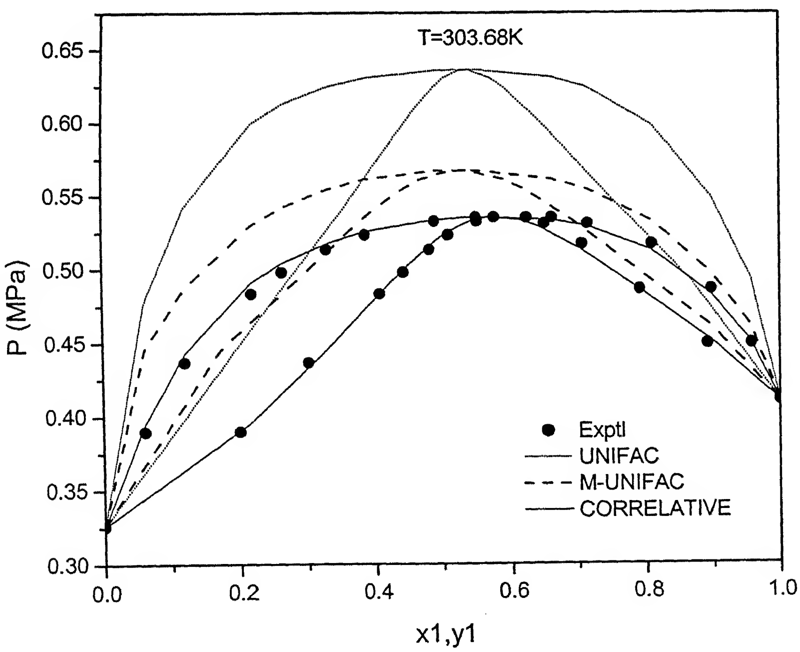

Figure 4.87 P-x-y diagram for R600a (1)/R236fa (2) system using 'Ar' and 'R134a' as ref. fluids and scaling factor δ

Table 4.91 Results of VLE Calculations for R600a (1) / R236fa (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

x_1	y_1				P (MPa)			
		Calculated				Calculated		
Exptl	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE	Exptl	UNIFAC	M-UNIFAC	CORRELATIVE
T=303.68K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.3258	0.3258	0.3258	0.3258
0.0612	0.2007	0.2830	0.1983	0.2226	0.3896	0.4235	0.3890	0.3970
0.1199	0.3023	0.3942	0.3031	0.3306	0.4365	0.4879	0.4312	0.4457
0.2192	0.4084	0.4772	0.4038	0.4271	0.4833	0.5422	0.4742	0.4929
0.2645	0.4434	0.4971	0.4342	0.4546	0.4980	0.5546	0.4864	0.5057
0.3297	0.4818	0.5170	0.4693	0.4854	0.5135	0.5654	0.4988	0.5183
0.3876	0.5100	0.5301	0.4957	0.5079	0.5232	0.5712	0.5064	0.5258
0.4897	0.5528	0.5502	0.5378	0.5436	0.5327	0.5766	0.5141	0.5334
0.5509	0.5766	0.5634	0.5634	0.5655	0.5354	0.5778	0.5160	0.5352
0.6625	0.6240	0.5962	0.6172	0.6131	0.5352	0.5750	0.5135	0.5328
0.7148	0.6511	0.6184	0.6482	0.6415	0.5309	0.5700	0.5091	0.5282
0.8099	0.7073	0.6788	0.7204	0.7103	0.5172	0.5498	0.4935	0.5113
0.8979	0.7914	0.7755	0.8175	0.8071	0.4865	0.5108	0.4668	0.4814
0.9579	0.8922	0.8846	0.9119	0.9053	0.4494	0.4670	0.4395	0.4499
1.0000	1.0000	1.0000	1.0000	1.0000	0.4107	0.4107	0.4107	0.4107
$\overline{\Delta y}$		0.0369	0.0108	0.0122	%AAD	8.420	2.906	0.953

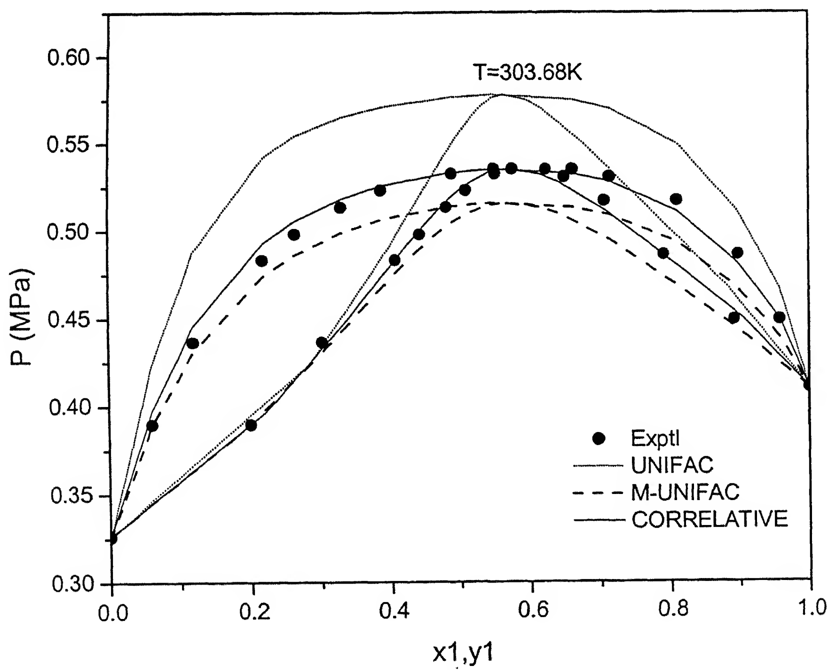

Figure 4.88 P-x-y diagram for R600a (1) / R236fa (2) System using 'Ar' and 'R134a' as ref. fluids and scaling factor ω

Table 4.92 Results of VLE Calculations for R600a (1) / R236fa (2) System using Pure components as ref. fluids

x_1	y_1				P (MPa)			
Exptl	Exptl	Calculated			Exptl	Calculated		
		UNIFAC	M-UNIFAC	CORRELATIVE		UNIFAC	M-UNIFAC	CORRELATIVE
T=303.68K								
0.0000	0.0000	0.0000	0.0000	0.0000	0.3258	0.3258	0.3258	0.3258
0.0612	0.2007	0.2832	0.1985	0.2226	0.3896	0.4233	0.3888	0.3971
0.1199	0.3023	0.3944	0.3033	0.3306	0.4365	0.4877	0.4310	0.4457
0.2192	0.4084	0.4774	0.4039	0.4271	0.4833	0.5420	0.4740	0.4929
0.2645	0.4434	0.4973	0.4343	0.4547	0.4980	0.5543	0.4862	0.5057
0.3297	0.4818	0.5172	0.4695	0.4855	0.5135	0.5652	0.4986	0.5183
0.3876	0.5100	0.5303	0.4957	0.5080	0.5232	0.5709	0.5062	0.5258
0.4897	0.5528	0.5503	0.5379	0.5435	0.5327	0.5763	0.5139	0.5334
0.5509	0.5766	0.5635	0.5635	0.5655	0.5354	0.5776	0.5158	0.5352
0.6625	0.6240	0.5963	0.6174	0.6131	0.5352	0.5748	0.5133	0.5328
0.7148	0.6511	0.6185	0.6483	0.6414	0.5309	0.5698	0.5089	0.5282
0.8099	0.7073	0.6790	0.7205	0.7103	0.5172	0.5496	0.4933	0.5113
0.8979	0.7914	0.7756	0.8176	0.8072	0.4865	0.5106	0.4667	0.4814
0.9579	0.8922	0.8847	0.9120	0.9054	0.4494	0.4669	0.4394	0.4499
1.0000	1.0000	1.0000	1.0000	1.0000	0.4107	0.4107	0.4107	0.4107
$\overline{\Delta y}$		0.0370	0.0108	0.0122	%AAD	8.379	2.945	0.955

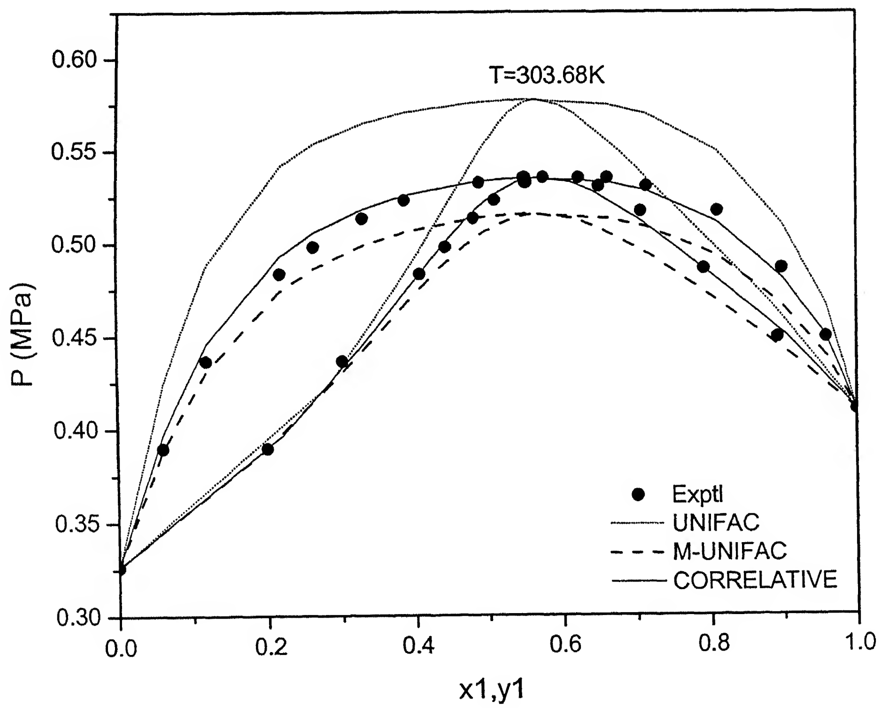

Figure 4.89 P-x-y diagram for R600a (1) / R236fa (2) System using pure components as ref. fluids

CHAPTER 5
CONCLUSIONS

A new thermodynamic model which originally integrates the G^E-EOS mixing rule technique in a three parameter corresponding states EOS framework has been applied in predicting the VLE behavior of thirty refrigerant mixtures including eight azeotropes. The fundamental aim of this method is to represent the whole thermodynamic behavior of a system of interest. The generality and simplicity of this new mixing model are of great advantage in engineering applications. In this work, prediction of VLE only is considered. All the conventional G^E-EOS approaches assume limiting values for the pressure, i.e. $P=0$ or $P \rightarrow \infty$, to allow the combination of the G^E model for liquid with the G^E equation from one-fluid model. The proposed model does not make any limiting value assumption about the pressure variable, which is maintained at its real value. The mixing rules present two possible modes, one correlative and one completely predictive.

Though correlative model reaches a good accuracy level, it depends largely on the quality of the experimental data needed to set it up. If the experimental accuracy level is not guaranteed or, at worst, if the data are not available, it becomes necessary to resort to a completely predictive model.

In the correlative mode, the proposed models are consistent because the activity coefficients are generated iteratively from input data (P, x_i, y_i, T) using the model itself and they do not demand any selection and correlation of a historic liquid phase G^E model suited for the system. However, the predictive model does not require any experimental data for y_i and P.

In summary, on the basis of the results presented here, correlative method gives excellent results for both azeotropic and non-azeotropic systems. If experimental data are not available predictive method can be used for VLE prediction of refrigerant mixtures. However, poor results are obtained for azeotropic mixtures. The results also indicate that EOS used for the reference fluid need not be of very high accuracy. Cubic equation of state is suitable. If pure components of the mixture are used as reference fluid with an

equation of state valid over the entire range of study, difficulty in selecting reference fluid can be avoided.

5.1 SUGGESTIONS FOR FUTURE WORK

Scaling factor δ, based on saturated liquid density, has been used for vapor phase calculations. More accurate results are expected if a scaling factor based on saturated vapor density is used for vapor phase calculations.

This work concentrates only on prediction of VLE behavior of binary refrigerant mixtures. However, this model is not limited to VLE calculations alone and can be used for volumetric property evaluation too. But scarce availability of both density and VLE data for systems limits the scope of such a study.

This work can be extended to other binary systems of importance. It can also be applied to multicomponent refrigerant mixtures or other multicomponent systems of importance.

APPENDIX

The Montreal Protocol in its condensed version

The Montreal Protocol in 1987 signed by 46 countries stipulating 50% reduction in CFCs by 1998. The Montreal Protocol in its condensed version consists of the following:

1. Production and consumption of the fully halogenated CFCs will be frozen to 1986 levels as of 1 January, 1989;

2. The first reduction would take affect in 1991

3. Reducing production and consumption to 80% of the 1986 levels and

4. The next reduction would occur in 1998 with another 30% reduction, bringing about production and consumption to a total 50% of the 1986 levels.

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